RAILROAD GAZETTE

CONTROL OF INTERURBAN TRAFFIC

It was announced a few days ago that the New York Central had secured control of the Syracuse Rapid Transit and the Utica & Mohawk Valley companies, operating electric lines which compete for the short-haul passenger traffic in the territory served by the steam railroad in northern New York State. This is the most important step in meeting trolley competition which has been made since the New York, New Haven & Hartford took over the electric lines in New Haven, as a definite base from which ultimately to maintain an electric short-haul service of its own and to prevent further paralleling of the main and branch lines in this district. It has been frequently pointed out in the *Railroad Gazette* that this method of controlling trolley competition by setting a rogue to catch a rogue is undoubtedly the best way of taking care of the short-haul business in the vicinity of large cities, in view of the tremendous inroads which the electric lines have made in this territory within the last few years.

In the issue of August 21, 1903, a paper was printed discussing some of the operating features of the Utica & Mohawk Valley line, which constitutes part of the present purchase, running from Rome to Little Falls, 38 miles, through the city of Utica, with a branch to Clinton nine miles long. The company almost at the outset picked up an interurban business of some $30,000 a month, entirely independent of the heavy traffic in the city of Utica, and an efficient express service is maintained in connection with the passenger traffic. It seems quite evident that the steam road will be better served by having the Utica & Mohawk Valley as an ally instead of as a competitor, for these lines form the nucleus of what was likely soon to become a very serious competition indeed. At Syracuse the problem which the company has to face is the prevention of the establishment of a competitive paralleling electric line to Rochester. The country is well adapted for the interurban business, and it seems obvious that it would, in the near future, have been a troublesome locality if the steam road had not taken the trolley business into its own hands.

Control of the interurban lines in competitive territory is so reasonable and so easy a solution of the problem, that even at this time, when only the beginnings have been made, it seems remarkable that the chance has been so long neglected by the steam roads. A few years ago it would have been far easier and far cheaper than at present to secure either the properties as they then existed, or the franchises; a few years hence it will be far harder and far more expensive than it is now. The New Haven road and the New York Central are in the van of a movement which must shortly come in the many localities where the electric road is obviously the best agent for handling short-haul traffic. The steam roads now have a chance to build up an excellent collateral source of income and to establish at the same time an ally and a defense. If they neglect to do so they are sure to lose much, both of old business and of new profit. The interurban people in the last few years have been carrying on a most valuable object lesson in the development of suburban territory, and with that development goes also a suggestion of the way city tracks and terminals can be efficiently and economically cleared of the local passenger traffic, that is expensive to provide for and that blocks the way of the through traffic which is the natural function of the steam road.

TRACK INSPECTION.

Elsewhere in this issue will be found the results of the annual inspection of track on one English and three American railroads, all of which have adopted the premium system of rewarding good work in that department. The four reports are presented together in a group, simply to show the slight differences in the working of the system, and not for the sake of comparison of results on one road with those on another, because comparisons would be obviously unfair, even if all of the markings of the inspectors were reduced to one common basis. In this, as in so many other details of railroad operation, the one important thing is the final result obtained, rather than the method of accomplishing it. Each of the four roads whose reports are shown are trying to improve the standard of track work by encouraging good work with rewards in the shape of money prizes or suitable emblems; other roads are doing the same thing in other ways, by careful superintendence and inspection, by disciplining slovenly employees and promoting conscientious men to positions of more responsibility. The value of the premium system depends largely on the caliber of the men who are putting up track, and it becomes beneficial or demoralizing as it encourages a spirit of healthy rivalry or a spirit of jealousy and discontent. The annual inspections on which rewards under this system are based, must of necessity be superficial in many ways. There is nothing about a railroad that is so deceptive as a piece of track and nothing is more affected by local conditions. As the inspectors go over the road they may find at one place a rough stretch, full of kinks and low joints, which needs, however, only a few days' work to be put in first class shape. Possibly just before the inspection the section foreman or the supervisor has been devoting all of his attention to holding a sliding bank or draining a wet cut and could not get his track in good surface until his other work was finished. Nevertheless, he gets a low mark. At another place the inspecting party may ride over what is apparently a fine piece of smooth and even track, but which, with a few hours of rain, can be reduced to worse condition than the average construction track. Give a section foreman or supervisor a few days' notice of an inspection, and he can straighten and lift a poor piece of track under his charge up to an almost perfect surface and alinement that will last until the first hard rain. Then all the loosely tamped ties and low joints will begin to show up as glaring evidence of the kind of work that was done. It is not that the inspectors mark unfairly or incompetently in making their inspection, but that they judge the condition of track while riding over it, and it is seldom that they have an opportunity of making a close examination of the quality and amount of work that has been done. It is obviously unfair to a man who is working conscientiously day and night, and perhaps with the greatest degree of skill on a hopelessly bad piece of track, when the announcement of prizes and rewards for the year gives the premium to another man who has no wet cuts, sliding banks, or ballast that is a mere excuse for such to worry about, but who spends his time tamping a little here and a little there and adorning the grounds about his "Prize Section" sign with flower beds and little piles of whitewashed stones. Perhaps this is putting the case too strongly, but it illustrates the truth of the statement made before, that in a large measure the value of the premium system depends on the men who are working under it. If they are the kind of men whose one aim is to make good track and to keep it good, then the premium system can do no harm, but will encourage them to keep on doing better every year. The average man likes to beat the other fellow at any game; but, unfortunately, every one is not endowed with that quality, sometimes called the "sporting spirit," which makes a man keep on going as hard as he knows how, even when he sees he is beaten. If a man is so heavily handicapped by local conditions that he stands no chance in the race to win a prize with some other man further along the line, he is quite apt to be discouraged and to feel that it is no use trying to make the track under his charge any better than it is. The annual inspection is a good thing for all the officers and men on the road, but the conditions found on inspection day should not be relied upon to indicate the conditions which hold for the other 364 days in a year. When the station agents and the track men and all of the other humble employees of the road know that the "G. M." and his party are due on a certain day, at a certain hour, they are very likely to have everything cleaned up and in the best of order. This has one great value in that it shows what can be done, but it seldom shows what is done when the "old man" is not around. The railroad officer who depends on a yearly trip of inspection to show him the condition of the property under his charge, is far from being acquainted with the true state of affairs. He has the right to demand, however, that if things can be done in a certain way when he is around, then they can be done in the same way when he is in his office a thousand miles away.

THE RAILROAD LAWS OF MASSACHUSETTS.

A volume compiled by the Railroad Commission of Massachusetts, setting forth, to some extent, in condensed form, the statutes of that State relating to steam railroads and street railways, deserves somewhat specialized study for several reasons. The State is a commonwealth where railroad problems have received careful attention; the formative and plastic epoch of railroad lawmaking long ago was passed and, except as to certain phases of street railways, the body of laws in the State is crystalized and permanent; and no State of the Union has tried

harder, with more intelligence and with greater success, to reconcile on a basis of justice the conflicting claims of the corporation and the public. In a volume of 142 pages we can only select a few examples of railroad law, but they are suggestive and become more so when we contrast them with the statutes of neighboring States.

Men still in middle life will recall the reaction that set in soon after the panic of 1873—and the long drag that followed it—against the municipal aid for new railroad projects in which so many dollars of the taxpayers were lost. In Connecticut, for instance, the evil had to be checked sharply by a constitutional amendment adopted in 1877, which declares that "no county, city, town, borough or other municipality shall ever subscribe to the capital stock of any railroad corporation, or become the purchaser of the bonds or make donation to or loan its credit directly or indirectly in aid of any such corporation." But conservative Massachusetts allows municipal subscriptions to railroad enterprise, hedging them about, however, with close restrictions. The subscriptions, at most, cannot exceed 2 per cent. of the total valuation (tax list) of the city or town and in smaller municipalities they must not exceed 1 per cent.; two-thirds of the legal voters must authorize the subscription; no municipality shall let its "railroad" debt run up its total debt beyond 3 per cent. of valuation; and there are other modifying checks. That such statutes will stand suggest how much happier—or, any rate, less dismal—than in other States has been the experience of Massachusetts with the old "town aid" abuse.

In somewhat the same line may be noted the liberality of the State in contributing to the abolition of grade crossings. An official report, just made to the State Legislature, throws vivid light on the subject. Under a law passed 14 years ago there have been eliminated in the State 174 crossings at a total cost of $22,603,669, of which the State has contributed $6,019,406 and municipalities $2,927,769. Under the State law the railroad companies pay 65 per cent. of the cost of eliminating the crossing, the municipality not more than 10 per cent., and the State the remainder—in general practice 25 per cent. By way of contrast Connecticut lays one-half the cost of elimination on the municipality and one-half on the railroad company, the State contributing nothing.

The subject of taxation in Massachusetts is too large a one to treat fully here, but special reference may be made to the statute for local taxation of street railways imposing a sliding scale of tax on gross earnings, ranging from 1 per cent. on $4,000 a mile up to 3 per cent. on $28,000 a mile or more—the tax money to be used for improving public ways and for removal of snow. Contrast with this the Connecticut plan, by which taxes of street railways—1 per cent. on par of bonds and floating debt and 1 per cent. on stock at an official market valuation—all go to the State treasury, although the street railways are essentially localized properties. Or, again, contrast the Massachusetts plan with the astonishing statute of 1902 in Rhode Island, by which, in practice, a sliding scale of taxation to the State on gross earnings is made a formal contract with the commonwealth and then intrenched behind the Federal Constitution. Authorities will differ as to the theory of State, as contrasted with local taxation applied to steam railroads, especially since the latter have become consolidated into systems. But as to the justice of the municipal tax of the local trolley road there can hardly be more than one opinion.

Puritan-founded Massachusetts has enacted, in regard to Sunday trains, a brief statute allowing the running of such trains by consent of the railroad commission if public necessity and convenience require it, but "having regard to the due observance of the day." Puritan-founded Connecticut goes, in theory at least, a good way further in protecting Sunday. "Except from necessity and mercy" no Sunday trains can be run within the State between sunrise and sunset. But the State railroad commission can interpret the "necessity and mercy clause," and it does so with some liberality. The Massachusetts statute says nothing specifically about Sunday freight; but the Connecticut statute prohibits the handling of freight between sunrise and sunset on the day except from necessity or mercy—with a reservation that the commission may allow handling of freight up to 8 o'clock in the forenoon between railroads and steamboats for purposes of preservation. In practice, through freight trains run across the State pretty regularly on the Lord's Day and throughout southern New England. We should probably find less of Sunday statute-making for railroads if railroad competition had been more intense.

The distinctive feature of Massachusetts railroad law is the great authority given to her railroad commission. A noteworthy addition in that direction is a statute passed in 1903, giving that body the same power as to freights and fares, over steamship carriers between ports of the commonwealth as the commission has had over steam railroads and street railways. Those powers already were vast, including pretty sweeping authority as to persons and papers, operation, rates, capitalization—under the well known and now thoroughly tested "replacement value" statute for street railways—and, indeed, reaching almost through the whole limbo of railroad finance and administration under the statutes. In the more detailed and less generalized features of those statutes may be remarked briefly the purchase power which the State has reserved of buying out a railroad corporation for capital paid in, with 10 per cent. a year added since the payment; the privilege of a director or of an owner or owners of one fiftieth of the capital stock of a railroad or street railway company of calling for an examination of its financial condition; bonds not to exceed capital stock actually paid in; stock increase to be issued at not less than market value or sold at auction for not less than par; grade crossings of steam and electric roads—prohibited since 1895 in Connecticut—allowed only by consent of commissioners; free transportation of one bicycle per passenger; free passes to State officers forbidden; cheap morning and evening trains and trains for workingmen; personal liability of street railway directors until full payment of capital stock; special street railway rates for public school children; and, finally, the opening to savings bank investment of certain classes of conservative street railway bonds of which the last report of the Massachusetts Bank Commissioners shows the savings banks and trust companies of the State had taken $3,769,594.

Other commonwealths have laws similar to some of the foregoing but in few of them have the statutes such amplitude, and in none are the law and its enforcement so closely bracketed together as in Massachusetts. She has not only had the statutes but she has tried them out to the point of survival of the fittest and her sister States, some fifteen of which have not even appointed railroad commissioners, can coin high profits from her experience and example.

The Northern Securities Injunction.

Judge Bradford filed an opinion in the United States Circuit Court at Trenton, N. J., July 15, granting a preliminary injunction restraining the proposed plan for the distribution of the assets of the Northern Securities Company in the proceedings instituted by Edward H. Harriman, Winslow S. Pierce and the Oregon Short Line. It will be recalled that out of a total of $155,000,000 of Northern Pacific stock deposited at the time the Northern Securities Company was organized, $78,000,000 was deposited by the Harriman-Union Pacific interests; an amount which carries control. But the proposed pro rata distribution of Northern Pacific and Great Northern stock would have occasioned that the Union Pacific interests would have received a large share of the Great Northern stock which they did not previously possess, yet not enough to carry control; while they would have lost the control of the Northern Pacific, with which they went into the merger. As mentioned in the *Railroad Gazette*, April 8, it was claimed by the petitioners that the decision of the Circuit Court on June 7, 1903, directed that the stock be returned share for share, and that the plan proposed for a pro rata distribution would leave control in the hands of the same people who now control and would defeat the ruling of the Supreme Court. This suit, however, was terminated by the denial of the United States Circuit Court at St. Paul, April 19, of the application for leave to intervene in the case of the United States against the Northern Securities Company, and Judge Thayer in delivering the opinion held that the plan of the directors of the Northern Securities Company for the distribution of the stock of the Great Northern and Northern Pacific companies was not violative of the decree in the Northern Securities case; also, that no one but the United States could successfully appeal to the Court to enjoin the extension of that plan on the ground that it was in violation of the Sherman anti-trust act. The Judge further said in his opinion that the stock of the two railroad companies was not in the custody of the Court, but he added that an intervention was not necessary to enable the petitioners to protect any pecuniary interest or equity that they might have.

Without determining the merits of the more important questions raised by the complainants, Judge Bradford gives as the reason for the temporary restraint that the legitimate object of a preliminary injunction, preventive in its nature, being the preservation of the property or rights in controversy until final decision, the principal loss or inconvenience which can be brought about by the temporary injunction is the inability of the present stockholders to realize immediately upon their holdings; but this he considers as nothing, compared with the irreparable injury which the complainants would sustain by a refusal to restrain.

He holds that if the final decision should be adverse to the complainants, the interests of the defendants may in the meantime be protected by an order from the Court requiring a bond of sufficient size to indemnify them.

The effect of this temporary decision on the market was to cause a rally of several points in Union Pacific and Southern Pacific and a decline in Northern Securities. The latter company can either accept the injunction and await the main suit, or they can appeal from Judge Bradford's decision. It is not obvious that there will be very much to be gained by appealing this lesser point in the main contention which the company makes that it can distribute its assets pro rata in the process of dissolution, enforced by the original Northern Securities decision.

Accounting Switching Charges.

Transportation and accounting officers have given much earnest attention to the consideration of means which will adequately provide for the protection of the revenue derived from switching freight cars, but as yet no simple and efficient method has been devised for surrounding this source of revenue with the proper safeguards and at the same time providing for convenient settlement as between the interested companies. The many industries along the line, calling for the movement of cars to and from convenient tracks within their grounds for loading and unloading by the road hauling the freight, or by another road whose geographical position requires it to intervene to perform this work, or to perform the service of conveying cars from one road to another, when that is necessary to continue a through movement of the car, necessitate countless car movements.

The general conditions and circumstances attending the handling of such cars present many difficulties to the auditing department, which has devoted much study to the subject. The true conditions surrounding the actual performance of the work do not appear at first sight, and there is much difference between specific cases that each industry is really a study by itself. The first difficulty seems to be to find a system providing for the proper and timely record of the cars to be switched and one that will be sufficiently simple in its detail to be readily understood by all the employees who handle the cars, and at the same time give to all interested, proper information of the work to be done, and to the accounting department, a complete history of all the performances, so that it may be placed in possession of the proper evidence to check the revenue and to settle the accounts.

The next difficulty is to originate some form or order or blank which will meet all these requirements and give full effect to any system which may be created without involving cumbersome detail or uncertainty of meaning. With these points settled, there would doubtless be little trouble in adjusting any other differences of opinion as to proper and safe methods for the protection of revenue from this source, and there is enough revenue in this feature of railroad transportation to engage serious attention. That it has been so engaged is very clearly evidenced by the fact that many methods have been tried out in the effort to reach the much hoped for solution of the whole question.

Three plans were reported to the Association of American Railway Accounting Officers at their Saratoga meeting in June last, but they all lacked the essential of simplicity, and were open to other objections, so that the difficulty of harmonizing all the interests, meeting all the demands of the situation and providing for satisfactory operation by the freight agents, yardmasters and switchmen, has not yet been overcome. It is very desirable that some comprehensive and efficient plan with the necessary blank forms needed to make it successful, should in the near future be brought out through the deliberations of the committee of accounting officers having the matter in charge.

Cincinnati, Hamilton & Dayton.

The recent announcement of the merger of the Cincinnati, Hamilton & Dayton, Pere Marquette and Chicago, Cincinnati & Louisville railroads is one of great interest. Although it is doubtful if it will have any extensive effect on the traffic situation of the Middle West, it should prove of much importance to the three roads interested, as it will make them far stronger, so far as control and interchange of traffic is concerned, in a considerable territory. Including all leased and proprietary lines and those over which trackage rights are held, the new system will control about 3,450 miles of track. In addition, it will operate ferries on Lake Erie, running from Conneaut to Rond Eau and Port Stanley and also on Lake Michigan, running from Ludington to Kewaunee, Manitowac and Milwaukee. The chief terminal points on the new system will be Buffalo, Chicago and Cincinnati, and its branches will run through the largest commercial centers in the States of Indiana and Ohio. The total capitalization of the three properties merged is as follows: C., H. & D., $33,333,000; Pere Marquette, $76,173,622, and C., C. & L., $10,460,000. Taking the aggregate mileage worked by the three railroads as 3,200 the capitalization per mile of the new system will be about $37,000. The aggregate gross earnings of the three properties can only be approximated, as the Chicago, Cincinnati & Louisville has been in operation for such a short period that its earnings are not yet on a permanent basis. The figures from the last reports of the C., H. & D. and the Pere Marquette show total gross earnings on these two roads of $19,000,000, which, combined with those of the C., C. & L. (estimated at $5,000 per mile over 263 miles operated) will give the new system an earning power of over $20,000,000. Dividing this by 3,200, the mileage operated by the system, leaves an earning capacity of about $6,000 per mile. The strength of the consolidation seems to lie chiefly in the immense volume of local traffic which these railroads control. We give below the ton miles and passenger miles, together with the freight and passenger density of the C., H. & D. and the Pere Marquette, showing how the two roads compare and what they will contribute individually to the new consolidation.

	C., H. & D.	Pere Marquette.	Total.
*Ton miles	830,652	993,995	1,824,647
*Pass. ton miles.	109,506	129,643	239,149
Freight density.	818,376	459,120	584,074
Pass. density...	107,887	59,890	76,552

*Thousands.

As none of the railroads in the merger are dominant in the territory through which they pass, but are overshadowed by the Michigan Central, Lake Shore, Baltimore & Ohio and Big Four, they must rely on the future development of this local traffic. It is quite probable that in order to compete with the larger trunk lines in the east and west bound traffic a ferry will be established at Detroit connecting with the Pere Marquette at Walkerville, across the river from Detroit. In this way the through traffic can be handled via Toledo and Detroit, which will be a much shorter route than via Port Huron.

The third distressing passenger-train wreck of this month, the rear collision ot Glenwood, Ill., on the 13th, appears to have been due to the concurrent negligence of two, three or four men; and the explanation of what these men did or failed to do is so incomplete that little can be said until further information is forthcoming. A Chicago paper says that the passenger cars were of flimsy construction and that Engineman Hoxie had been on duty 15 hours. These points will, of course, demand attention in the final report, though it is to be borne in mind that a man is not necessarily worn out by 15 hours' service on a freight train and that the flimsiest cars in America are as strong as the great majority of the cars on many railroads in other countries. As to the specific cause of the collision, one obvious comment is already clearly indicated: that there is no such thing as a minor position on a train. The newest man, on the slowest train, has to be entrusted, now and then, with a duty as important as the duties devolving on the most experienced. This is such an elementary truth that we should hesitate to put it in writing, but for the fact that it is so often ignored in practice. The brakeman on the leading car of the string of 30 being backed from Thornton to Glenwood had a duty as lookout, and probably as the responsible person to decide if it were safe to start from Thornton, as important as if he had been the conductor or the engineman. Engineman Hoxie is said to have a good "character," but it is also said that he has been on the road less than a year. Men long acquainted with their road have many times taken risks and come out all right; for newer men the trick is not so easy. A conductor going out with a flag can trust experienced subordinates to manage the train in his absence; while others, with less experience, cannot be thus trusted; and usually the conductor is left to decide for himself how far, or in what kind of work, he can trust a man whose acquaintance with the road or with train work is limited. Surely, the lowest conductor must be a man of the highest grade, if there is to be any elasticity whatever in our train rules.

NEW PUBLICATIONS.

Legal Decisions in Car Service Cases. Published by the National Association of Car Service Managers, A. G. Thomason, Secretary, Scranton, Pa.

This is a pamphlet of 256 pages, giving in full all of the recorded judicial decisions in demurrage suits which Mr. Thomason has been able to find, the compilation having been made in pursuance of a resolution passed by his association last year. There are 44 decisions, including some made by minor courts, and one by the United States Treasury Department; but there are opinions by the Supreme Courts of Massachusetts, Georgia, Kentucky, Virginia, District of Columbia, Tennessee, Pennsylvania, Illinois and Mississippi.

TRADE CATALOGUES.

The London & North-Western issues an illustrated pamphlet bearing the title, "Information for Visitors to the St. Louis Exposition, 1904." A brief history of the road is given, with illustrations of some of the first locomotives used, including the "Rocket," which was designed and built by George Stephenson, in 1829. The initial run of this famous engine was made on the

Liverpool and Manchester section of this road. Illustrations throughout the pamphlet picture the company's rolling stock, road bed, stations, etc. Views are also given of the company's exhibit at St. Louis, which includes a quarter size model of the Royal saloon cars, and a model of the company's steamer "Anglia," used on the Irish steamship service between London and Dublin. Other illustrations show Shakespeare's birthplace, Warwick Castle, etc. The pamphlet closes with a reproduction of a drawing made in 1839, which shows the unique method used in excavating the Tring cutting on the L. & N. W. Ry. in 1837.

The July number of *Something Pneumatic*, the magazine of the Chicago Pneumatic Tool Company, contains an article on "The Value of the Air Drill in Remote Shops," a large number of half-tone engravings of various pneumatic devices in service and descriptive information relative to the Duntley air-cooled electric drill, improved "Little Giant" flue expanders, lightning hose clamps and a new compression lever riveter.

CONTRIBUTIONS

Automatic versus Telegraph Block System.

New York, July 19, 1904.

To the Editor of the Railroad Gazette:

An editorial on the collision on the Erie Railroad at Midvale, N. J., which appeared in your issue of July 15, seems inaccurate, not in its main argument, but in the side issue. That "the first question . . . is not one of systems, but rather whether the system used was managed in the best possible way" is presumably unquestionable. But you further say, "whether the failures of the track circuit, plus the errors which enginemen have made in automatics but would not have made if watched by signalmen, have equaled or exceeded the errors of signalmen under a similar volume of traffic *no one knows*." In other words, no one knows whether the telegraphic block or the automatic block is the safer system.

This statement seems to be a distinct step backwards. Wire-connected manual signals —and the great majority of manual signals are wire-connected—are probably more liable to fail than the most thoroughly perfected type of automatic signal. When the signals are located over 2,000 ft. from the operating tower the manual signal is surely less reliable. Also with manual signals we have the chance of an error by the signalman, the operator at the tower in advance and the engineer. With the automatic signal the chance of human error is 1 to 3, as compared with the telegraphic block. The great safeguard of the track circuit in detecting back-up movements, open switches and other dangerous conditions makes the automatic system a more complete and more reliable protection than the telegraphic block system.

The *Railroad Gazette* was among the first to realize and approve of automatic block signaling, first as a protection theoretically more perfect, and, later, as an often proved fact. The writer particularly recalls an editorial in your January 1 issue of the present year on this subject. For this reason the suggestion in last week's editorial seems to require some notice. D. B.

Our correspondent agrees with us as to what is the first question to be considered. Having gone that far he will admit that the question at issue is not one of correct principle in the construction or management of signals in the future, but of actual accomplishment in the past. The statement quoted was not equivalent to saying that no one knows which is the safer system. To paraphrase fairly he would have to include cases where enginemen have disregarded automatic stop signals and have not been detected. Admitting, for the sake of argument, that the chance of human error is as 1 to 3, we must add, in favor of the telegraph block, the likelihood of human perversity, which leads an engineman to take a risk with automatic signals which he would not take with the telegraph block, or which, if the telegraph block were in use, he would have no temptation or opportunity to take. In considering the mechanical efficiency of wires 2,000 ft. long and such dangers as back-up movements, "D. B." is broadening the discussion unwarrantably. The original statement looked toward the settlement of only one question, namely, has the telegraph block system been proved so inefficient in operation as to justify or demand its abandonment and the adoption of automatic signals in its place? No step has been taken backward, for nothing has been said that does not agree with what was said on January 1. "D. B." has fixed his mind on things said there which referred to the highest ideal. In the present case the discussion has to do, not with ideals, but with what has actually been accomplished. A court holds a railroad company up to the "state of the art" as the judges find it by looking at the actual accomplishments of reputable and exemplary railroads, not as it would be found by looking at inventors' prospectuses or even at the accomplishments of a few of the most advanced railroads. We have not forgotten the merits of the track circuit; neither can we forget the great record for safety which has been made by the block system worked by men.—Editor.

The Prussian State Railroads have ordered 278 additional locomotives, to be delivered in the months December, 1904, to March, 1905, inclusive. Among them are to be 58 four-cylinder compound express engines, ten-wheeled with four drivers, 4 smaller compound express engines, 16 passenger engines, 18 superheated steam passenger engines, 26 superheated steam tank passenger engines, etc.

Relining Winston Tunnel on the Chicago Great Western.

The Winston tunnel on the Chicago Great Western, located near Rodden, Ill., about 12 miles southeast of Galena, penetrates a high ridge that shuts off the approach of the railroad to the Mississippi River. The tunnel, which is 2,440 ft. long, was built 18 years ago by Winston Brothers. The engineers who located it expected to encounter solid rock, there being a layer of limestone some distance above the line of the tunnel. After work was begun the material was found to be principally hard blue shale, which is quite hard when first exposed, but decomposes rapidly in the presence of air and water. The tunnel was lined with wood, the original arches being made of 12-in. x 12-in. timbers, spaced 4 ft. apart. As these showed signs of decay other timber arches were placed beneath them until finally there was a complete double lining of 12-in. x 12-in. timber arches, spaced from 1 to 4 ft. apart in different parts of the tunnel.

The tunnel required constant attention,

East Portal of Winston Tunnel, Chicago Great Western.

and it and the banks of the approach cut on the east were a constant source of danger and annoyance. In order to do away with any further trouble it was decided to re-line the tunnel with brick and concrete and build retaining walls in the cut.

The plan called for the lowering of the track sufficiently to allow leaving in the roof timbers. The original intention was to remove the front and back rows of plumb posts entirely, but this proved impracticable owing to the treacherous nature of the material back of the posts. It was therefore decided to remove the front row only, leaving in the back row. By so doing it was possible to get a wall 3 ft. thick, which was quite sufficient. The wall was built of Portland cement concrete, faced with vitrified brick. To remove the plumb posts an 8-in. x 12-in. sill or straining beam was first notched in on the No. 1 pieces of the timber arches and drift-bolted there. Posts 10 in. x 10 in. were then placed about 4 ft. apart on a batter so as to clear the foundation excavation and also clear the passing trains. There was just room for these posts. The plumb posts were then removed and the foundation for the wall was dug. It was necessary to undermine the back posts in getting the foun-

Partially Finished Section of Tunnel Showing Arch Centering.

Sides Bricked and Original Timber Lining in Crown.

dation to the required grade and in several instances slides occurred which delayed the work somewhat, but not seriously.

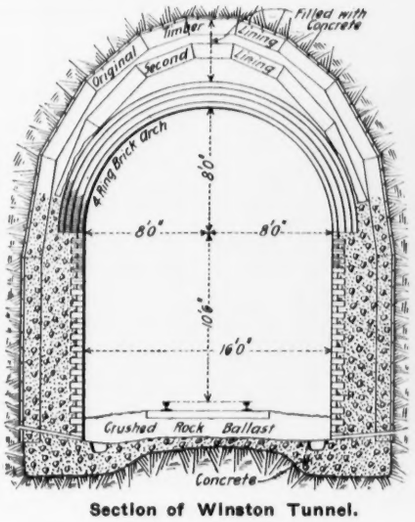
Both walls being finished to the springing line, the track was lowered from 1 to 3 ft. over a distance of 4,000 ft. through the tunnel and approaches. Owing to the heavy traffic this work proved very tedious and expensive. Stretches of 150 ft. were gradually worked down to subgrade, a run-off being put in at the end of the work for the passage of trains. In the tunnel a 6-in. layer of concrete was placed from wall to wall under the ballast in order to seal out all water and mud. Outside of the tunnel 12 in. of crushed rock was placed under the ties.

After the track had been lowered and brought to final grade with ballast, the arching was begun. A four-ring brick arch was built underneath the roof timbers and the space between the timbers and the arch was packed solidly with concrete. This work was all done from the top of platform cars built especially for the purpose, the platform coming about 18 in. above the springing line of the arch. The mortar mixing was done on the floor of the car and the mortar passed through a trap door. The brick were tossed directly from the cars to the working platform as they were needed.

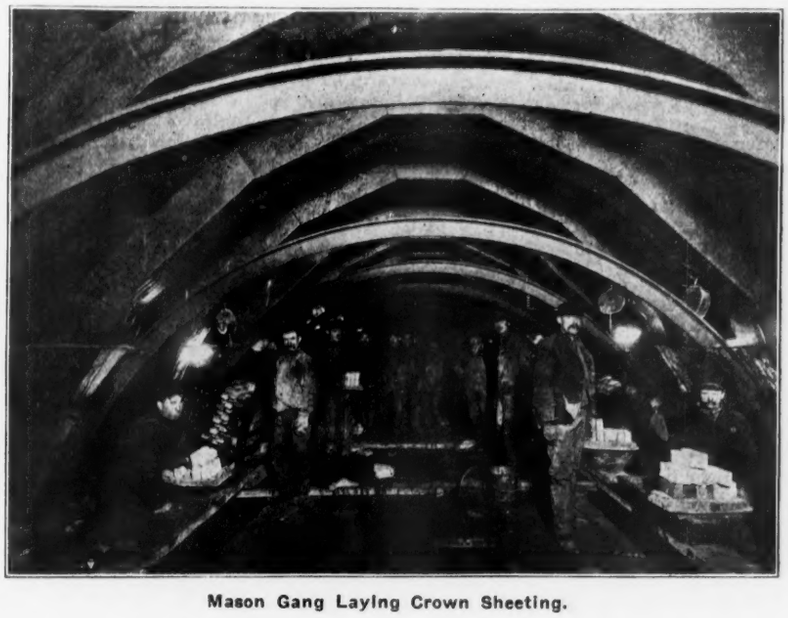
The arch is a complete semi-circle of 8 ft. radius. The centering was made of 4-in. x 4-in. x ½-in. T iron bent to a radius of 7 ft. 9½ in., so as to allow for 2½ in. of lagging. These ribs were spaced 5 ft. apart and supported on posts, wedges being used to bring them to exact position. Forty of these ribs were used, which allowed 200 lin. ft. of arch to be under construction at a time. It was necessary to have a considerable length of working face so that bricking up and backfilling with concrete could be carried on without interference. The arch was carried up about 2 ft. at a time in benches of 40 to 50 ft. length. When a section was completed and sufficient time had elapsed for setting, the centers were taken down and moved forward.

The outside work was also carried on in connection with the tunnel work. Heavy dry masonry retaining walls were built on each side of the east approach cut for a distance of 1,000 ft. A 24-in. tile drain was laid in concrete, extending from the east portal to the east end of the cut, which was designed to carry off the drainage of a considerable area of country which drains into the cut at this point.

The entire work required almost two years for completion, the greatest hindrances being the heavy traffic and the smoke. An average of 12 to 15 trains during working hours was common in the busy season. Their operation through the tunnel was controlled by a specially installed staff system. The work was carried to completion without serious accident and practically without delaying or impeding traffic. About 15,000 barrels of Medusa and Lehigh cement, 2,500,000 brick and 11,000 cu. yds. of gravel for concrete were used. The Lorimer, Gallagher & Walsh Construction Company, Chicago, had the contract for the entire work. It was planned and executed under the direction of Mr. F. R. Coates, formerly Chief Engineer of the road, assisted by Mr. A. Munster, Bridge Engineer, and Mr. C. H. Potter, Resident Engineer. Mr. W. T. Keating was Superintendent of the work for the contractors.



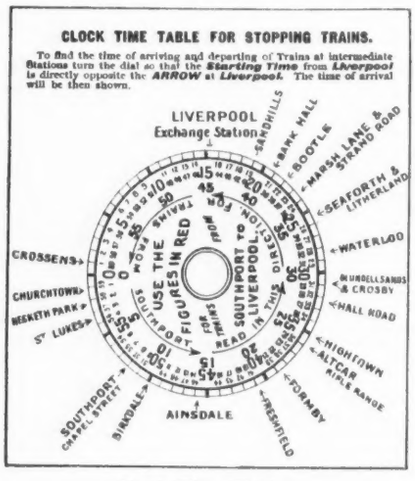
Section of Winston Tunnel.



Mason Gang Laying Crown Sheeting.

Traffic Features of the Lancashire & Yorkshire Electric Service.

The electrification of the branch of the Lancashire & Yorkshire between Liverpool, Southport and Crossens, for the purpose of most advantageously and economically taking care of a heavy suburban passenger traffic, has been fully described in previous issues of the *Railroad Gazette*, so far as the engineering features are concerned. Certain of the traffic features, particularly the methods of handling the crowds at stations and on trains, are of considerable interest. The company has printed a number of circulars which are designed in part to advertise the service and in part to give instructions to passengers, and these instructions cover a number of points which will be at once recognized from their similarity to American conditions by travelers out of New York, Chicago, or any one of twenty other large cities in this country. A circular at hand calls attention to the fact that a frequent and quick suburban service cannot be secured without the stopping time at stations being cut down to a minimum. In order to obtain this there are notice boards at all station platforms, except Liverpool (Exchange) and Southport, indicating the position on the platform where passengers will be required to stand when waiting for trains. A diagram accompanies this paragraph, showing a train from Liverpool to Southport in its relation to the two notice boards on the platform. Between the Liverpool end of the train and the first notice board is the compartment for third class smokers. Between the two notice boards is the compartment for first-class passengers and between the second notice board and the Southport end of the train, the compartment for third class non-smokers. In the reverse direction, Southport to Liverpool, the position for passengers is the same. That is to say, the compartments for smokers of both classes will always be at the Liverpool end of the train. This is a very simple matter to arrange, and it is a great advantage that the passengers can always classify themselves in the same places on the platform, thus avoiding much confusion at the rush hours.



Clock Time Table.

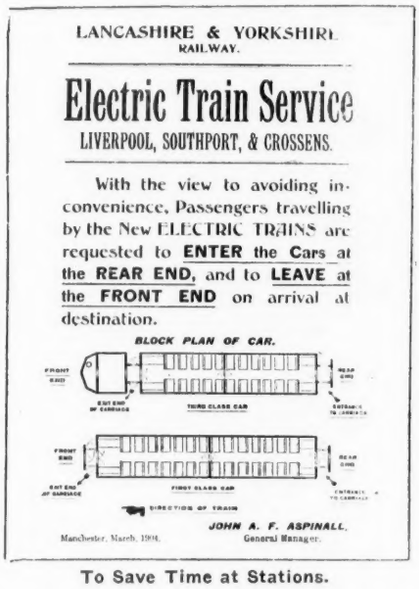
The disk, or clock, time-table, illustrated herewith, is also a unique device for timing the arrival of one's train at any station on the line. All that is necessary is that the number of minutes past the hour at which the train leaves a certain station be placed against that station by rotating the disk, and the exact time at which the train arrives at each of the other stations will be shown by the figures opposite them on the disk. In the original, as can be judged from the cut, the lower range of figures is red, and is intended for use in reading the running time of trains moving in the opposite direction. To have such a time-table effective it is, of course, necessary that the running time of all trains, or at least the running time of all trains which the time-table is intended to provide for, should be the same; but, where such conditions are found, as, for example, on the regular trains of the elevated roads in New York City, such a time-table would prove quite a convenience to passengers. The novelty of it has doubtless proved a little puzzling at the outset to patrons of the Lancashire & Yorkshire, but the trick once learned—and it is a very simple one—no handier time card could be imagined.

The rule that no article must be taken into the cars which cannot be put in the racks, or disposed of without inconvenience to other passengers, or which would interfere with entering or leaving the cars, relates to a difficulty which is more characteristic of English practice than it is American, although the fact that racks are provided, and racks sufficient in capacity to really carry bundles, might well be noted by nearly every railroad in the United States. The New York, New Haven & Hartford has shown especial care in this matter for years, but on most roads it is a convenience much needed but seldom found.

Map of L. & Y. Electric Service.

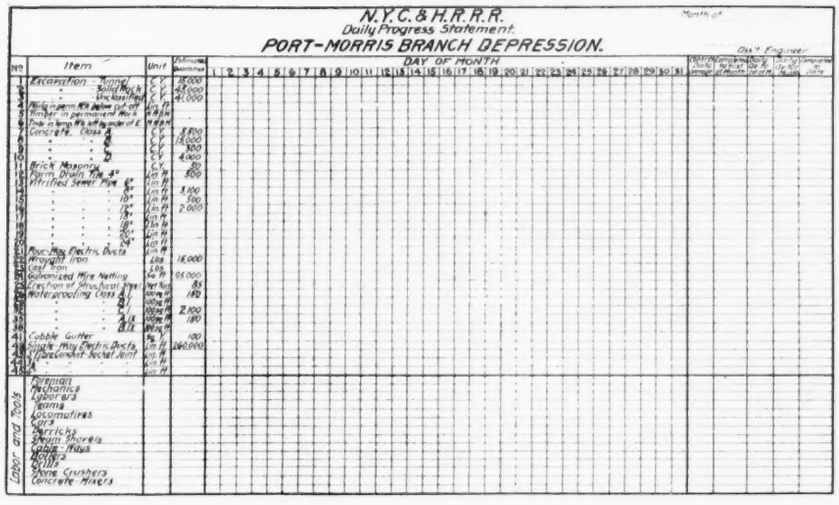
Another paragraph in the Lancashire & Yorkshire announcement states that, in accordance with the notice posted inside the cars, passengers will enter at the rear end and alight at the front end of each vehicle in the direction in which the train is traveling. The obvious purpose of this regulation is to avoid confusion and to lead to the quick despatch of the trains from the stations, and passengers are provided with a special circular telling them just how to enter and leave the cars. This rule is most excellent, and it seems rather surprising that so little effort has been made to carry it out in America. In some cases signs are posted requesting passengers to observe this procedure, but no really systematic effort seems to have been made to keep the current of traffic moving in one direction. The blockading of the path of the outgoing passengers by the rush of passengers attempting to board the car is a continual source of delay on rapid transit lines everywhere in this country, and if the English managers, by starting in at the very outset with this sensible rule, can get it grafted into tenacious British custom, they will have accomplished a great deal toward facilitating suburban traffic.

A special baggage car service is provided to avoid carrying heavy baggage on the regular trains, and in connection with this service a system of checking almost precisely like that in use in America, but a decided novelty in the United Kingdom, has been introduced. It was obviously necessary to have some such arrangement if the luggage was not to be carried at the same time with the passenger—and, indeed it always rather surprises the American traveler to get his own baggage at all, when its delivery seems to depend entirely on claim of ownership and the services of the porter. The circular says that whenever the baggage of passengers is in large quantities or of a heavy or bulky character, it will have to be delivered at the station in sufficient time to be despatched by the baggage car service in advance of the train by which the passenger intends to travel, so that it may be at his disposal when he arrives at his destination; but, in case it is not received in time to be sent out ahead of the passenger it follows on the next baggage car train and can be claimed by check, quite as in American practice. Arrangements have also been made at all stations between Liverpool and Southport to collect and deliver passengers' baggage at low, fixed rate. Moreover, at each of the stations there is a certain area at which luggage consigned under the "Luggage in Advance" system will be collected and delivered free, thus putting a premium on sending one's baggage ahead instead of carrying it in the car. This service seems very liberal and must afford a great accommodation to passengers, since no charge whatever is made for transportation, unless the weight exceeds 150 lbs., first class, and 100 lbs. for third class passengers. The company conducts a special parcel business also, at low rates, performing a service quite similar to that found on some of our interurban electric lines.



To Save Time at Stations.

Until April 1 second class carriages were run on this branch of the Lancashire & Yorkshire, but since that time, to simplify the service, they have been discontinued.



Daily Progress Statement.

Passengers buying tickets through from other places on the Lancashire & Yorkshire system to places on the Liverpool and Southport line, will still be able to obtain second class tickets, entitling them to travel in carriages of that class as far as the point where they join the electrified branch, but these tickets will be only available for third class on the electric trains. Special arrangements were made for holders of existing second class season tickets to enable them to exchange them for tickets available in first class or in third class carriages on the electric lines after April 1.

In connection with this circular of directions the company prints a schedule to show what the rates and taxes might be expected to amount to at each of the stations on the line for a house renting at $150 a year. The estimate includes the charge for taxes, water and gas, and is given with a view to promoting the country through which the line passes as a residence district. Indeed, the possession of full information is quite an important inducement in the choice of a home. The company points out that the rates and taxes on its line compare favorably with those paid for houses of a similar rental on the Chelsea side of the Mersey, and are in some instances considerably lower.

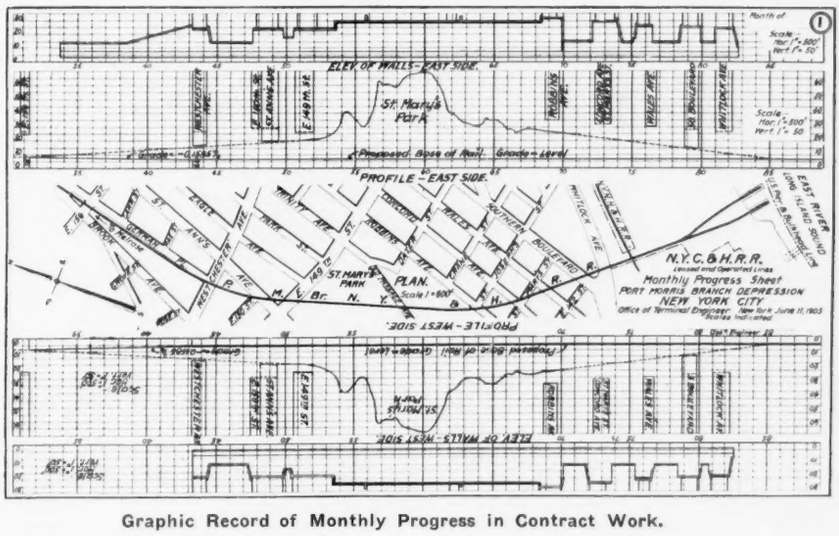
The care with which all these little traffic details have been worked out, and the enterprise with which they are presented in attractive form to perspective travelers, should be important assets in the welfare of the line. Conditions have been met with a rapidity and ingeniousness which seems quite unlike the conservatism of the old established steam railroad lines in England, and is far more suggestive of the opening up of suburban country by electric lines in the United States. It is just this kind of enterprise which has made the American interurban lines successful in short-haul traffic at the expense of their steam competitors, and the results of this attempt by an old established railroad in England to protect itself against this kind of competition by maintaining and increasing the attractiveness of the service offered will be watched with considerable interest.

Progress Reports—Contract Work.

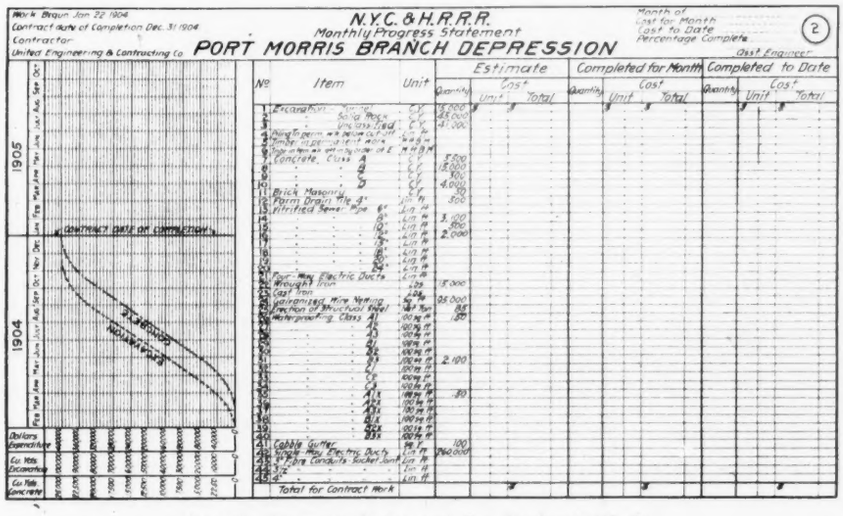
BY G. R. WADSWORTH.*

Record of progress on contract work is usually kept more or less in detail for an office record and for the information of engineers and officers in charge who have little opportunity to visit the work. Reports of a tabular and graphical nature, together with photographs, best illustrate the situation. The accompanying sheets prepared for progress records of the depression of the Port Morris branch of the New York Central, now in progress under contract with the United Engineering & Contracting Co., of New York, give a fairly comprehensive and accurate view of the situation each month.

The sheets are white prints of a uniform size, 7 in. x 12 in. inside margins, and are bound with copies of the voucher, estimate and distribution sheets for the corresponding month. The daily progress statement, compiled from the inspector's daily reports,



Graphic Record of Monthly Progress in Contract Work.



Monthly Progress Statement for Contract Work.

gives a record of the plant and labor, together with the output. The daily averages illustrate the increase or decrease in the rate of work, and may be compared with the contract daily average, which is figured on the basis of completing on contract time. The monthly progress statement is compiled from quantities derived from actual sections and is used for the basis of the monthly estimate. The more important quantities, excavation, concrete and total expenditure are illustrated graphically. The unit prices, estimated cost, and expenditure curve are omitted in the illustrations for obvious reasons. The curves are plotted to finish within contract time, and the actual progress is plotted from month to month. It is also of interest to plot a curve showing the estimated cost to the contractor, when data is obtainable. The monthly progress sheet illustrates the scope of the work within a small compass and the excavation and concrete work done during the month and to date is shown by crayon shading on the white print.

*Asst. Terminal Engineer New York Central.

Tests for Detecting Brittle Steel.*

Most of the steel now made will more than meet the requirements of the specifications in general use. This has given a false sense of security, and too many chances are being taken. In some cases the cold bending tests have been omitted on boiler steel and the material accepted on the results of tension tests alone. Hundreds of boilers are made every year under these conditions. Every now and then a plate fails in shop work and samples taken from such plates generally will not bend flat cold. We have no means of learning how many other brittle plates, which do not fail in shop work, are put in boilers. The failures generally occur in thick material, and in most cases the ordinary cold bending test, as called for in the specifications, would have detected the brittleness.

There are other cases where axles, rails, etc., are put in service without any physical tests being made. This is directly contrary to the specifications adopted by this society and the opinions expressed in the discussions at our meetings.

Some think that heat always has a softening effect on steel, as in annealing, and that the hotter the steel is finished in rolling or forging, the softer it will be. On the contrary, under such conditions heat has a hardening effect and is one cause of brittleness. The laboratory experiments on the effect of heat have been confirmed by the results obtained from large masses of steel. Steel finished too hot in rolling or forging will have a coarse grain and will fail under the ordinary cold bending and drop tests. The engineer cannot ignore this any more than he could ignore the effect of chemical composition. Under these conditions is it not proper and just that he demand of the maker some assurance that his steel is finished at the proper temperature? It is, of course, preferable to prevent, if possible, steel being made brittle than to take the chances of its being detected after it has been made brittle.

The society did well to specify that cold bends shall be made on each heat of steel in the condition it leaves the rolls. This has been more clearly defined by the committee on iron and steel structures of the American Railway Engineering and Maintenance of Way Association, in their specifications, as follows: "Full-sized material for eye-bars and other material 1 in. thick and over, tested as rolled, shall bend cold 180 deg. around a pin the diameter of which is equal to twice the thickness of the bar without fracture on outside of bend." This requirement has been put in general use and necessitates the bars being finished in rolling at a lower temperature, and large eye-bars are now made which meet the requirements of the full-size test very much better than formerly.

All specifications make concessions in the requirements for the heavy material, and it is a question if we have not gone too far in that direction, as it assumes that such heavy material will, of necessity, be finished at a much higher temperature than the lighter material. It also does not induce the maker to improve his methods. The necessary improvement in the present methods which would be required to finish the heavy material at the proper temperature would decrease output and increase cost of such heavy material. Is the consumer willing to pay more for a better material? If so, the maker would, no doubt, meet him half way.

It will not be necessary to adopt any of the more elaborate tests which have been suggested to detect brittle steel, if the finishing temperature is properly controlled and wide cold bends made of full thickness of material rolled. But in the case of forgings, castings, and other very heavy material, annealing will have to be more generally introduced.

*Extract of a paper presented by Wm. R. Webster at the Atlantic City meeting of The American Society for Testing Materials, June, 1904.

Steel Car Design.

IV.

BY A. STUCKI.

Flat Cars with Center Sills Carrying the Load.—Flat cars are often loaded with heavy concentrated loads and for that reason it is not safe to design for a uniformly distributed maximum load. It is best to design the car to carry two-thirds of the maximum permissible load concentrated at the center. This is:

44,000 lbs. for 60,000-lb. cars.
58,700 lbs. for 80,000-lb. cars.
73,300 lbs. for 100,000-lb. cars.

The moment in the center of the car due to this load, p, is

$$M = \frac{p}{2}\left(\frac{l}{2} - c\right)$$

Assuming the weight of the car body as p_1

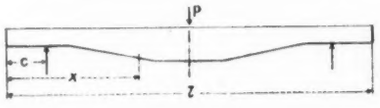


Fig. 13.

uniformly distributed throughout the whole length, then the moment for any section between the bolster and the center of the car, at a distance x from the end is

$$M_x = \frac{p_1 x}{2}\left(\frac{l}{x} - 1 + \frac{c}{x}\right)$$

To find the value of the moment in the center substitute for x, the value $\frac{l}{2}$ from which $M_1 = \frac{p_1}{2} \times \frac{l}{2}\left(\frac{2c}{l} - \frac{1}{2}\right)$

Instead of assuming two-thirds of the nominal capacity of the car as concentrated in the center, it can be assumed that three-quarters of the nominal capacity is concentrated at one side of the center at a distance from the bolster equal to one-third the distance between truck centers. Or, one-half of the nominal capacity of the car can be assumed as concentrated on each side of the center at a distance from the bolsters equal to one-third the distance between truck centers. In all three cases the moments at the center are equal. The following table gives the moment at the center of the car for different lengths of the three capacity cars. In the table the moments M and M_1 due to the load and the weight of the car, are combined.

Combined Moments in Center of Car Due to Load and Dead Weight.

Length Over End Sills.	Distance. c. to c. Trucks.	60,000-Lb. Cars. in. Lbs.	80,000-Lb. Cars. in. Lbs.	100,000-Lb. Cars. in. Lbs.
34 ft.	24 ft.	3,510,720	4,611,960	5,706,000
36 ft.	26 ft.	3,829,440	5,025,720	6,214,200
38 ft.	28 ft.	4,133,760	5,423,280	6,704,400
40 ft.	28 ft.	4,080,000	5,362,800	6,637,200
42 ft.	30 ft.	4,403,520	5,781,960	7,151,400
44 ft.	32 ft.	4,709,760	6,181,680	7,644,000
46 ft.	34 ft.	5,017,920	6,583,560	8,139,000
48 ft.	36 ft.	5,328,000	6,987,600	8,636,400

In the above table, the weights of the three capacity flat car bodies were assumed as 16,000 lbs., 18,000 lbs. and 20,000 lbs., respectively.

In designing cars in which the center sills are to carry all of the load, the following tables will be found useful in determining the proper sections. Where the tables do not show the section modulus or moment of inertia for the exact section wanted, combinations can be made from the figures shown for similar sections, which will prove accurate enough for all practical purposes. For example, in Table I., if a $\frac{5}{16}$ in. sill with the reinforcement as per column 5 is the required section, the section modulus can be obtained by subtracting from the figure in column 5 the difference between the figures in columns 3 and 4. The result is a close approximation.

Allowance has been made for rivet holes in the tension member. The table is not carried beyond a depth of 24 in. because in deep sills, with the web and flanges of the same thickness throughout, much of the material is wasted so far as strength is concerned. Proper deductions have been made in the above table to compensate for the large fillets which are formed in pressed steel sills. The section modulii given for reinforced sills are for the bottom portion of the section and are a minimum.

In all the tables, where structural shapes for the sills have been shown, the rivet holes in the tension side have been considered, but in the compression side they have not been taken out, since well-driven rivets will fill the holes and no loss of strength in compression results.

To find the distance of the neutral axis from the extreme fiber, e_1, divide the mo-

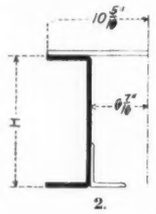


TABLE I.

MOMENT OF INERTIA AND SECTION MODULUS PER SILL FOR PRESSED STEEL CHANNEL SILLS.

1.	2.	3. Pressed Steel Sill Alone.		4		5. ⅜-in. Sill Reinforced With		6.	
		¼-in. Material.		5/16-in. Material.		⅜-in. Material.		3½ x 3½ x ⅜ Angle. 10¼ x ¼ Plate.		4 x 4 x ½ Angle. 10¼ x ⅜ Plate.	
H. Ins.		I.	Z.	I.	Z.	I.	Z.	I.	Z.	I.	Z.
10		56.5	11.3	68.8	13.7	81.2	16.2	184.7	33.6	236.8	42.3
11		71.0	12.9	86.7	15.7	102.5	18.6	228.1	37.9	292.1	47.8
12		87.8	14.6	107.3	17.8	126.9	21.1	276.9	42.4	353.8	53.4
13		106.7	16.4	130.6	20.1	154.6	23.8	331.1	47.0	422.2	59.1
14		128.0	18.3	156.9	22.4	185.8	26.5	391.2	51.7	497.7	65.0
15		151.9	20.2	186.3	24.8	220.8	29.4	457.3	56.6	580.3	71.1
16		178.3	22.3	218.9	27.3	259.6	32.4	529.3	61.7	670.1	77.2
17		207.5	24.4	255.0	30.0	302.5	35.6	607.6	66.8	767.4	83.5
18		230.6	26.6	294.6	32.7	349.7	38.8	692.8	72.2	872.5	89.9
19		274.7	28.9	338.0	35.5	401.3	42.2	784.3	77.6	985.4	96.5
20		312.9	31.3	385.2	38.5	457.6	45.7	882.8	83.2	1106.4	103.2
21		354.4	33.7	436.5	41.5	518.7	49.4	988.3	88.8	1235.7	110.0
22		399.2	36.3	492.0	44.7	584.9	53.2	1101.1	94.6	1373.4	116.9
23		447.5	38.9	551.8	47.9	656.2	57.0	1221.3	100.6	1519.8	124.0
24		499.5	41.5	616.2	51.2	732.9	61.1	1349.1	106.7	1674.8	131.2

ment of inertia for any given section, as shown in the table, by the corresponding section modulus. The distance e_o can be obtained by subtracting e_i from the extreme height of the sill. The section modulus for compression, Z_o, is found by dividing the moment of inertia I by e_o. Many combinations can be made in the use of the tables so that the section modulus Z of almost any variation in the web and cover plates and in the angles can be obtained. Heavy members are hard to punch, and for this reason the thickness of the material in any section should never be greater than the diameter of the punch. In practice this limit is seldom approached.

To obtain the same fiber stress in the top and bottom flanges of the sills under a maximum load and a maximum end shock F, the respective distances from the neutral axis must bear the following relation to each other:

$$e_i : e_o :: \left(s + \frac{F}{A}\right) : \left(s - \frac{F}{A}\right)$$

A is the total cross-sectional area of the section and s is the allowable fiber stress.

The use of the above ratio gives an excessive stress in the bottom flange when the effect of the end shock ceases. The bottom of the section should, therefore, be designed for the tensile stress induced by the load alone and the top portion of the section for the stress due to load and end shock combined.

In the sill shown in Fig. 14, the line of application of the end shock F is a distance a above the neutral axis. The maximum compression per sq. in. in the top portion is

$$s_o = \frac{M}{Z_o} + \frac{F}{A} + \frac{Fa}{Z_o}$$

The maximum tension per sq. in. in the bottom portion is

$$s_i = \frac{M}{Z_i}$$

and in order to make the two stresses equal the relation between e_o and e_i must be varied

Fig. 14.

to suit the conditions imposed. The stress usually allowed is 12,500 lbs. per sq. in.

Example: Design a 36-ft. flat car of 60,000 lbs. capacity with plate girder center sills to carry the whole load and side sills to carry a uniformly distributed load between the deep cross-bearers and body bolster to the next point of support. To find the sec-

TABLE II.

MOMENT OF INERTIA I AND SECTION MODULUS Z ARE CALCULATED FOR BOTTOM PORTION. 13/16-IN. RIVET HOLES HAVE BEEN SUBTRACTED FROM EFFECTIVE AREA FOR TENSION SIDE.

WIDTH OF WEB = H − ½ in. $e_i = \frac{I}{Z}$ $e_o = H - \frac{I}{Z}$.

	H = 18 in.		H = 20 in.		H = 22 in.		H = 24 in.		H = 26 in.		H = 28 in.		H = 30 in.	
Angles.	I.	Z.	I.	Z.	I.	Z.	I.	Z.	I.	Z.	I.	Z.	I.	Z.
3½ x 3½ x 5/16	721.6	76.8	940.0	90.2	1183.0	103.2	1473.2	118.0	1789.6	132.4	2151.0	148.0	2559.8	166.0
⅜	814.8	86.6	1052.8	100.8	1328.0	115.8	1648.2	132.0	1998.4	147.8	2397.6	164.8	2842.0	182.6
7/16	904.4	96.2	1167.4	111.8	1469.6	128.0	1814.2	145.0	2202.8	162.8	2641.6	181.4	3120.8	200.2
½	993.4	105.6	1279.2	122.4	1607.8	139.8	1981.6	158.2	2402.4	177.2	2872.0	197.0	3392.8	217.4
9/16	1078.2	114.6	1386.6	132.6	1741.0	151.4	2142.8	171.0	2596.8	191.6	3098.0	212.2	3655.4	234.0
⅝	1159.4	123.2	1491.2	142.8	1868.8	162.4	2298.0	183.2	2780.0	204.8	3315.8	227.0	3911.4	250.2
4 x 3 x 5/16	749.6	79.8	967.0	92.6	1218.6	106.4	1506.8	120.6	1833.0	135.6	2218.4	152.8	2611.0	168.0
⅜	848.0	90.2	1090.6	104.4	1370.4	119.4	1695.0	135.6	2050.0	151.6	2453.8	168.6	2902.4	186.6
7/16	925.2	98.4	1213.0	116.2	1520.8	132.4	1871.0	149.6	2264.8	167.4	2709.4	186.0	3194.0	205.0
½	1046.8	111.4	1308.4	125.2	1663.2	144.8	2042.8	163.2	2489.6	183.6	2945.2	202.2	3472.0	222.6
9/16	1126.4	119.8	1441.6	137.8	1802.4	156.6	2211.0	176.4	2671.6	197.0	3179.6	217.8	3743.4	239.6
⅝	1212.2	129.0	1550.0	148.0	1936.0	168.2	2372.8	189.2	2861.8	210.8	3405.2	233.2	4008.2	256.4
4 x 4 x 5/16	786.6	83.8	1018.6	97.8	1287.6	112.8	1595.4	128.0	1944.0	144.4	2335.2	161.2	2769.6	178.6
⅜	914.2	95.2	1155.6	111.0	1456.6	127.4	1800.0	144.4	2189.0	162.4	2622.0	180.6	3106.6	200.0
7/16	998.6	106.6	1288.0	123.6	1620.0	141.6	1998.2	160.2	2424.0	179.6	2900.6	199.6	3427.0	220.4
½	1099.2	117.2	1415.2	135.8	1776.6	155.2	2190.0	175.4	2653.0	196.4	3169.0	218.0	3741.0	240.4
9/16	1193.4	127.2	1535.4	147.2	1927.6	168.2	2377.4	190.4	2870.6	212.2	3425.4	235.6	4013.4	257.6
⅝	1288.8	137.2	1657.0	158.8	2078.6	181.4	2561.0	206.6	3089.8	228.4	3683.8	253.2	4339.2	278.4

TABLE III.

MOMENT OF INERTIA I AND SECTION MODULUS Z ARE CALCULATED FOR BOTTOM PORTION; 13/16-IN. RIVET HOLES HAVE BEEN SUBTRACTED FROM EFFECTIVE AREA FOR TENSION SIDE.

WIDTH OF WEB = H − ½ in. $e_i = \frac{I}{Z}$ $e_o = H - \frac{I}{Z}$.

	H = 18 in.		H = 20 in.		H = 22 in.		H = 24 in.		H = 26 in.		H = 28 in.		H = 30 in.	
Angles.	I.	Z.	I.	Z.	I.	Z.	I.	Z.	I.	Z.	I.	Z.	I.	Z.
3½ x 3½ x 5/16	824.8	87.8	1075.8	103.2	1372.8	120.0	1716.4	137.8	2115.6	157.2	2554	176.4	3056	197.4
⅜	916.0	97.6	1193.6	114.4	1518.0	132.6	1891.8	151.8	2318.4	172.0	2798	193.0	3340	215.4
7/16	1022.2	108.6	1308.2	125.4	1659.6	145.0	2063.4	165.2	2522.8	186.8	3042	209.6	3620	233.2
½	1083.4	115.2	1420.0	136.0	1797.8	156.8	2231.4	178.6	2722.4	201.4	3274	225.4	3888	250.0
9/16	1177.2	125.0	1527.2	146.2	1930.8	168.2	2391.6	191.2	2934.6	217.0	3500	260.8	4150	266.6
⅝	1260.6	134.0	1629.4	156.0	2058.6	179.2	2547.4	203.6	3099.8	229.0	3718	255.4	4408	282.8
4 x 3 x 5/16	850.8	90.6	1112.4	106.8	1408.6	123.2	1756.0	141.0	2159.0	160.2	2602	179.8	3108	200.6
⅜	950.2	101.2	1231.4	118.2	1560.6	136.4	1938.8	155.6	2369.8	176.4	2856	197.0	3418	220.4
7/16	1046.4	111.2	1353.8	129.8	1714.0	149.6	2120.0	169.8	2585.0	191.4	3108	214.2	3694	237.8
½	1137.8	121.0	1469.4	140.8	1853.0	161.6	2292.2	183.4	2789.6	206.4	3348	230.4	3968	255.2
9/16	1225.4	130.2	1568.6	150.2	1990.2	173.4	2459.8	196.8	2989.4	221.0	3582	246.4	4242	272.4
⅝	1316.0	139.8	1691.0	161.8	2126.2	185.2	2622.0	209.6	3181.8	235.2	3810	261.8	4504	289.0
4 x 4 x 5/16	887.6	94.8	1159.4	111.6	1475.2	129.2	1844.6	148.4	2264.0	168.2	2738	189.4	3270	211.4
⅜	995.6	106.4	1296.2	124.8	1646.2	145.0	2049.2	164.6	2507.8	186.2	3034	209.6	3584	231.4
7/16	1099.8	117.4	1428.2	137.4	1811.2	158.6	2245.2	180.2	2751.2	205.6	3302	228.0	3924	253.2
½	1200.2	128.0	1561.2	150.0	1967.8	172.2	2472.8	198.6	2971.6	220.4	3570	246.2	4238	273.2
9/16	1294.4	138.0	1679.0	161.2	2117.4	185.0	2654.8	213.0	3190.4	236.8	3828	263.8	4538	292.2
⅝	1392.0	148.4	1800.8	172.8	2268.4	198.2	2804.8	224.8	3407.8	252.6	4086	281.4	4836	311.2

TABLE IV.

MOMENT OF INERTIA I AND SECTION MODULUS Z ARE CALCULATED FOR BOTTOM PORTION. 13/16-IN. RIVET HOLES HAVE BEEN SUBTRACTED FROM THE EFFECTIVE AREA FOR TENSION SIDE.

WIDTH OF WEB = H − ½ in. $e_i = \frac{I}{Z}$, $e_o = H + ½ \text{ in.} - \frac{I}{Z}$.

	H = 18 in.		H = 20 in.		H = 22 in.		H = 24 in.		H = 26 in.		H = 28 in.		H = 30 in.	
Angles.	I.	Z.	I.	Z.	I.	Z.	I.	Z.	I.	Z.	I.	Z.	I.	Z.
3½ x 3½ x 5/16	1386.4	139.0	1761.2	159.6	2190.2	181.2	2669.2	203.2	3206.4	226.0	3801.6	249.8	4457.0	274.0
⅜	1534.8	157.8	1964.4	182.6	2415.6	204.6	2943.2	229.0	3531.4	254.6	4181.6	280.4	4916.4	308.4
7/16	1673.6	175.8	2123.2	201.6	2633.4	227.8	3206.6	254.6	3844.0	282.6	4548.6	310.8	5326.4	340.2
½	1808.2	193.8	2295.0	221.4	2843.4	250.2	3460.4	279.6	4146.0	309.8	4902.8	340.6	5732.4	372.2
9/16	1935.8	210.8	2453.2	241.0	3044.8	272.0	3681.8	302.0	4433.6	337.4	5240.2	369.2	6140.0	404.2
⅝	2057.2	227.0	2608.8	259.6	3232.6	292.8	3932.0	326.8	4708.0	361.6	5582.8	398.2	6498.6	432.8
4 x 3 x 5/16	1441.2	143.8	1825.2	164.6	2261.8	186.0	2752.8	213.0	3300.6	231.6	3906.8	255.2	4573.6	279.6
⅜	1596.4	163.4	2021.2	186.3	2497.2	210.4	3036.4	235.2	3637.8	260.8	4300.4	286.8	5048.0	315.0
7/16	1751.4	183.4	2208.2	208.2	2730.8	235.2	3316.6	262.2	3967.4	290.2	4685.8	318.6	5469.2	347.8
½	1886.0	201.2	2383.8	229.4	2946.6	258.2	3577.0	287.8	4276.4	317.8	5068.2	350.4	5892.6	380.6
9/16	2021.2	219.2	2580.6	252.2	3155.2	280.8	3828.6	312.8	4575.4	345.2	5364.8	376.4	6297.6	412.6
⅝	2148.6	236.2	2702.8	268.0	3353.6	302.6	4068.6	336.8	4860.4	371.6	5732.0	407.4	6684.8	443.6
4 x 4 x 5/16	1520.4	155.2	1930.6	178.0	2397.2	201.8	2922.0	226.2	3507.4	251.8	4155.0	277.0	4867.0	303.6
⅜	1688.4	177.2	2144.8	203.0	2660.8	229.4	3240.4	257.0	3885.4	285.0	4598.0	313.6	5380.0	343.0
7/16	1851.2	198.8	2348.0	227.2	2911.4	256.6	3543.4	286.8	4245.8	317.8	5021.4	341.0	5870.6	381.6
½	2004.0	219.2	2541.4	250.8	3139.8	282.0	3833.0	316.0	4590.6	349.6	5426.0	384.2	6340.6	419.2
9/16	2145.4	*238.6	2721.4	*273.0	3373.6	*308.0	4104.0	*343.6	4914.6	*380.4	5807.4	*417.4	6784.2	*455.2
⅝	2287.2	*258.4	2900.0	*295.0	3597.2	*333.0	4375.6	*371.4	5238.8	*410.8	6188.8	*450.6	7227.8	*491.2

Figures marked * are not a minimum, and the moduli for the top portion should be considered.

TABLE V.

MOMENT OF INERTIA I AND SECTION MODULUS Z ARE CALCULATED FOR BOTTOM PORTION. 13/16 IN. RIVET HOLES HAVE BEEN SUBTRACTED FROM EFFECTIVE AREA FOR TENSION SIDE.

WIDTH OF WEB = H − 1/16 in. $e_t = \frac{I}{Z}$, $e_c = H + d - \frac{I}{Z}$.

Angles f.	Angles g.	d.	H = 24 in. I	H = 24 in. Z	H = 26 in. I	H = 26 in. Z	H = 28 in. I	H = 28 in. Z	H = 30 in. I	H = 30 in. Z
3½ x 3½ x ⅜	3½ x 3½ x 7/16	5/16	3183.6	243.7	3817.6	270.7	4511.4	297.9	5286.8	326.5
		½	3427.4	258.4	4113.9	287.4	4866.6	316.8	5688.6	346.4
		9/16	3712.3	276.0	4441.2	306.0	5244.0	336.8	6123.0	367.9
		⅝	3955.9	290.2	4728.2	324.6	5578.1	353.7	6508.0	386.2
4 x 3 x ⅜	4 x 3 x 7/16	5/16	3302.7	251.3	3943.5	277.9	4657.9	305.6	5439.5	334.1
		½	3558.6	266.5	4252.8	295.1	5017.9	324.3	5855.6	354.4
		9/16	3844.2	283.7	4589.1	313.9	5408.9	344.7	6306.1	376.2
		⅝	4093.6	297.9	4886.8	329.8	5755.3	362.0	6704.4	394.8
4 x 4 x ⅜	4 x 4 x 7/16	5/16	3489.6	275.2	4184.7	302.1	4951.5	332.7	5792.2	364.0
		½	3771.3	290.1	4514.2	321.5	5338.6	354.0	6238.2	387.0
		9/16	4070.6	308.8	4869.9	342.2	5749.6	376.3	6702.9	410.7
		⅝	4343.6	325.6	5191.7	360.7	6124.4	396.6	7137.0	432.5

tion of the center sills in the center of the car.

The moment per car is 3,829,440 in. lbs. (See table with Fig. 13.) The stress allowed per square inch is 12,500 lbs. and the necessary section modulus is therefore $\frac{3,829,440}{12,500} = 306.3$. In Table IV. a 30-in. girder with 3½ x 3½ x ⅜ in. angles, ¼-in. cover plate and ¼-in. web, has a section modulus of 308.4 for the bottom portion and the tension side is therefore safe. For the top portion or compression side

$$e_c = (30 + \tfrac{1}{4}) - \frac{4916.4}{308.4} = 14.35$$

$$Z_c = \frac{4916.4}{14.35} = 342.$$

$$R_c = \frac{3,829,440}{342}$$

or 11,200 lbs. per sq. in. compression. The available compressive strength per sq. in. in the top portion is 12,500 — 11,200 = 1,300 lbs., which corresponds with the expression (Fig. 14):

$$\frac{F}{A} + \frac{Fa}{Z_c} \text{ or } F\left(\frac{1}{A} + \frac{a}{Z_c}\right)$$

The cross-sectional area of the center sills is 33.3 sq. in. and the center line of draft is assumed to be 6¼ in. below the top of the sill cover plate. Therefore, a = 14.35 — 6.25 = 8.1 in.

Since $F\left(\frac{1}{A} + \frac{a}{Z_c}\right) = 1,300$ lbs., then $F\left(\frac{1}{33.3} + \frac{8.1}{342}\right) = 1,300$, or F = 24,250 lbs. In other words, the end shock can be 24,250 lbs. without exceeding the allowable fiber stress of 12,500 lbs. assumed in the beginning. To provide for heavier shocks than this it would be better to use a somewhat heavier section in order to obtain a greater available compressive strength in the top portion.

The center sills should be analyzed at intermediate points in the same way as just described. Especially at the body bolster, care should be taken that the combined compressive stresses in the *bottom* portion do not exceed the safe working stress. The deep cross-bearers, usually two per car, should be made strong enough to transmit any load on the side sills to the center sills. It is frequently assumed for the purposes of calculation that one-fourth of the nominal capacity is concentrated at each end of each cross-bearer.

In designing box and gondola cars with wooden body framing and with center sills designed to carry all of the load, the above method should also be used.

Deflection of Sills. The deflection of a tapered sill is, of course, greater than that of a sill of maximum and uniform depth throughout its length. A sill 24 in. deep for 10 ft. of its length at the center and tapered to 10 in. at the bolsters, 30 ft. apart, has 50 per cent. greater deflection than a sill 24 in. deep throughout its length. So long as the deflection is kept within reasonable limits, however, it is not objectionable in flat cars.

(To be continued.)

The Morrison Automatic Air-Brake Safety Valve.

The Morrison automatic air-brake safety valve is designed to control the setting of brakes if the air hose parts or bursts, preventing an emergency application. It is arranged to be added to the angle cock of the present air-brake equipment. The operation is by air pressure and by gravity, and it is claimed that it in no way interferes with the usual service and emergency applications.

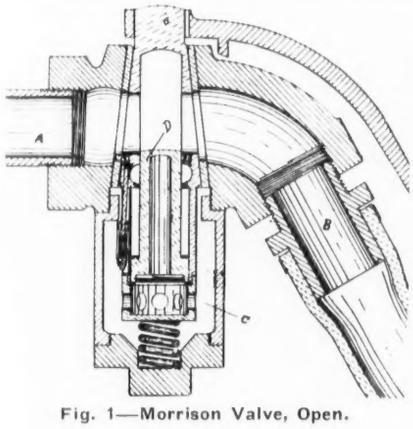


Fig. 1—Morrison Valve, Open.

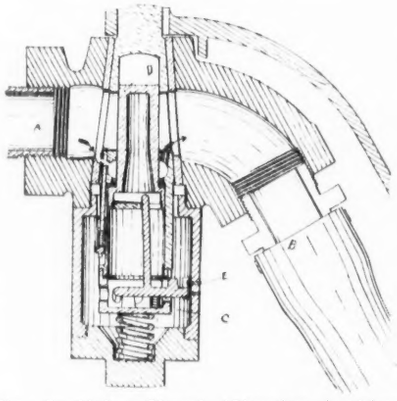


Fig. 2—Valve Closed (Showing Locking Device, E).

Illustrations are shown from which the operation of the device may be understood. When the air line is coupled up the pressure is equalized and valve D drops open and is not affected by service of emergency applications. The auxiliary reservoir "C" below the plunger "D" has the same pressure as the air line "A." Air is supplied to "C" through a feed groove alongside the cut-off plug. Should the air-hose break, the pressure of air in the auxiliary reservoir "C" instantly closes "D" as in Fig. 2. A slow leak around "D" from the air-line sets the brake gradually on the broken section, while on the section next to the locomotive the brakes are under the control of the engineman, the air pump being able to supply the air faster than the valve allows it to escape. One condition under which it is claimed the valve would prove advantageous would be in the case of a heavy freight train when it is desired to stop for water. The engineman would merely have to cut loose from the moving train and run to the tank, the valve at the front end of the train making a service application. When the locomotive couples on again the valve opens automatically. No change in present standard angle cocks is required, the mechanism being placed in an extension applied to the lower side of the cock. Where no angle cocks are supplied the cost of equipping a car is about $10. Applied to old cocks, the cost is less.

A test of some of the valves was made in the Hocking Valley yards at Columbus, Ohio, on July 13, in the presence of a number of railroad officers and of representatives of the Westinghouse Air-Brake Company. A train of ten empty coal cars were used, three of which were equipped with the valve. After a series of standing tests, the cars were put in motion and the train cut while running. The valves are reported to have worked satisfactorily in every case. Additional tests were made with a train of 28 cars—20 with and eight without air. They were cut off at from eight to 12 cars back of the engine, with results equally as satisfactory as in the first case.

The valve is the invention of Mr. F. B. Morrison, formerly a locomotive engineman. The Morrison Automatic Safety Valve Company, Toledo, Ohio, C. W. Munson, President, has been organized to make and sell the device.

Premium Track Inspection.

A number of railroads in this country have put into operation in connection with the annual trips of inspection by the general officers a premium system for rewarding efficient work in the maintenance-of-way department and at least one road in England has recently adopted a similar plan. In a general way the system now in use on all of these roads is the same and has for its object raising the standard of track work by promoting a spirit of rivalry between the men in charge of different sections of the line. Minor differences in the nature and amount of the premiums offered and the basis of marking are, however, of interest.

The London & South-Western put the new system into operation for the first time last March, when the annual inspection was made. The entire line was gone over by the Chief Engineer and his party and two judges, drawn from the engineering staff of the road, but stationed on some other division than the one under inspection, judged each section of the track, the mark given to a section being an average of the markings of the two men. The inspectors considered the condition of a section under four different heads—alinement, condition of surface and joints, condition of ballast, general appearance and efficiency. Each of these elements was marked on a basis of 100 per cent. and the final mark for a section was, therefore, on a basis of 400.

Cash prizes were awarded to the inspec-

tor or supervisor in charge of the best track on each superintendent's division and also to the foreman and men under him in charge of the best section on each inspector's district. The inspectors received two pounds, the section foremen one pound and the plate layers ten shillings each. In addition to these prizes, two challenge cups were put up, one for the inspector having the highest mark and one for the section foreman having the highest mark. Silver medals to become the property of the winner of the cups each year were given with the cups, and bronze medals to the platelayers under the foreman winning the cup.

The best mark for an inspector's district was 364.4 for a section of track 19.8 miles long. Of the section foremen, the best mark was 382 for a section two miles long. The general average for the system was 340.09, and lowest mark for section foreman was 245. The report of the chief engineer giving the results of the inspection, comments on the high average found and on the value of the inspection in increasing the interest taken in their work by the officers and men in the maintenance-of-way department.

On the New York Central the annual track inspection is made during the latter part of October, by which time the track has been put in good shape for the winter season, after the summer's work. The inspection is carried on under the direction of the engineer of maintenance-of-way. The road is divided into six divisions, in charge of division engineers, and each of these is further divided into sub-divisions in charge of supervisors. Each subdivision includes from 10 to 37 sections, and premiums are awarded to the section foreman having the best section on any one sub-division. Premiums are also awarded to supervisors of the sub-divisions showing the best average mark for the division. Supervisors making the best showing on their respective divisions receive a premium of $10 additional pay per month for the year following the inspection, and the supervisor of the sub-division showing the highest mark for the system, receives an additional premium of $5 per month, so that it is possible for the man making the best showing on the whole system to receive a total of $180 per year extra pay. Each section foreman who receives the highest mark on his respective sub-division is awarded a premium of $3 a month extra pay, and the foreman having the best section on each division receives an additional premium of $2 a month. Yard sections are kept separate from the main track sections, and the foreman in charge of the best yard section on each division receives a premium of $3 a month for the year. The accompanying reproduction of the table of detail percentages for the fifth annual inspection, shows the markings for each section on the entire system, and the averages for the system and for each division and sub-division.

On account of the differences in local conditions on sub-divisions and the difficulty of awarding sub-division premiums on a fair basis, the New York Central has decided to discontinue the premiums awarded to supervisors, but premiums for section foremen will be retained and some additional premiums will hereafter be awarded to foremen on side lines. The local conditions on each section of a sub-division do not vary so greatly, and a fairer basis of award can be used. In awarding the premiums, the company states that the object of the system is to reward foremen for their individual efforts during the year, rather than for the appearance of their section on the day of inspection, and this is as it should be.

The Southern Pacific is another road which has adopted the premium system on the lines west of El Paso, but the conditions of track and permanent way are very different from either of the two roads previously mentioned. Only two prizes are given, one to the roadmaster having the highest average mark for his district and one to the section foreman having the highest mark of any section on the system. The result of the inspection is given in detail in a printed pamphlet which is distributed among the men, so that while there are not so many premiums to be tried for, each man has a chance to compare his work with that of the other men, and in this way a spirit of competition is fostered. The inspecting party, which consists of the general manager of the system or the assistant general managers of the groups of lines into which the system as a whole is divided, the engineer of maintenance-of-way and the superintendent, resident engineer and roadmaster of the division over which the party is traveling. In marking, the condition of alinement and surface is rated on a basis of 25; spiking ties, lining and spacing ties, switches and frogs, 25; drainage and ballast, 20; material, grass and weeds, right-of-way, 10; houses and grounds, 10; sidings, 5; road crossings, run-offs and fencing, 5; total, 100. Besides these, the inspectors also mark the condition of all depots, shops, round houses, pump houses, fuel oil plants and miscellaneous structures on a basis of 10, and these markings are included as part of the report for each division. Each member of the party keeps an independent record of his markings, and these are averaged up at the conclusion of the trip.

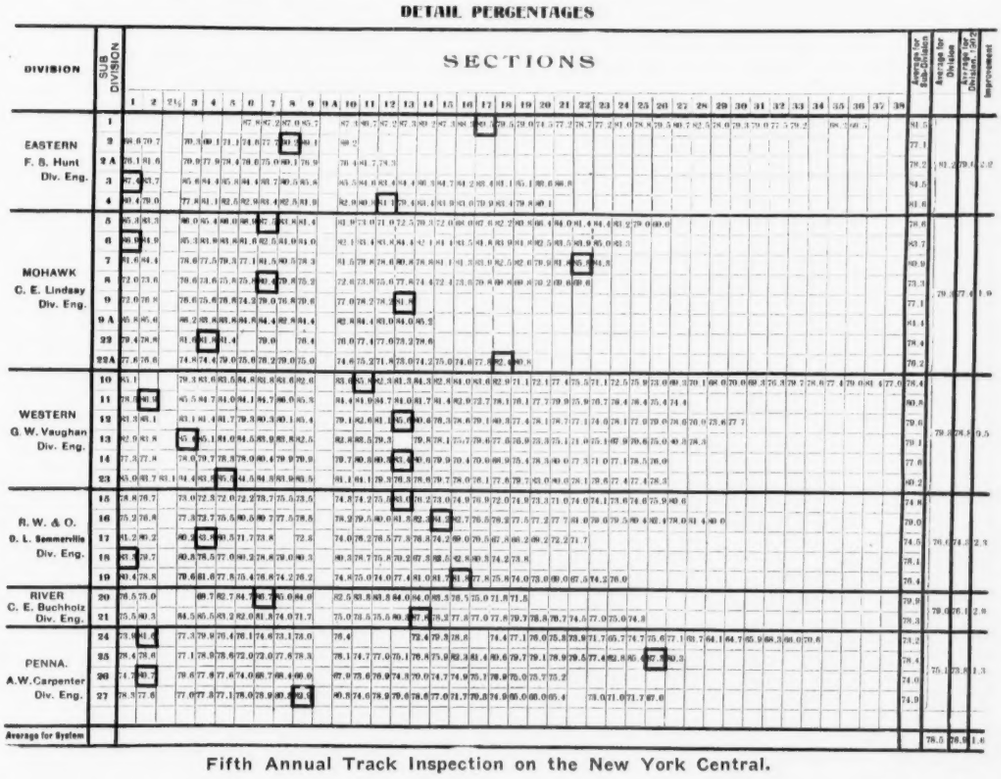
For the annual inspection of 1903 the best mark for a roadmaster's district was 93.2, on the Tucson division of the main line. This division also received the highest mark for a whole division, 90.9. The best section was section 18, on the Los Angeles division, which received the excellent mark of 98. The average for the system was 87.2.

The Pennsylvania has a premium system which differs in many respects from that on the other railroads previously mentioned. The money prizes awarded are fewer in number, but each is quite a large sum in itself. Two special inspections of the main lines between Philadelphia and Washington and Jersey City and Pittsburg are used as a basis for making the awards. One of these is a periodical inspection once in every six weeks throughout the year by a special committee, consisting of the chief engineer of maintenance of way, engineer of maintenance of way and four division superintendents, none of whom are in charge of main line divisions. This committee makes a test of the condition of the track with the aid of instruments designed for the purpose and mounted in a car attached to one of the first class passenger trains in each direction. This car and the method of making tests with it was described in the *Railroad Gazette*, January 9, 1903. The markings for each division for each inspection are averaged at the end of

N. Y. C. & H. R. R.

Prize Sections in Square thus ☐ *Inspection of Tracks, October 22d to October 31st, 1903*

DETAIL PERGENTAGES



Fifth Annual Track Inspection on the New York Central.

the year and prizes are awarded as follows:

First premium, $1,200—$800 to the supervisor and $400 to the assistant supervisor having the best line and surface for the year between Jersey City and Pittsburg and between Philadelphia and Washington.

Second premium, consisting of four prizes of $800 each—$600 to the supervisor and $200 to the assistant supervisor having the best line and surface for the year on each of the main line superintendent's divisions between Jersey City and Pittsburg and Philadelphia and Washington. The winner of the first premium is not considered in the award of any of the second premiums.

Third or improvement premium, $1,000—$700 to the supervisor and $300 to the assistant supervisor of the Main Line division showing the greatest improvement during the year. The division taking the "improvement premium" is not, however, eligible for the second premium of $800.

The annual inspection of the whole system, known as the general manager's inspection, is usually made in October and the party consists of the general manager, chief engineer of maintenance of way, engineer of maintenance of way, all general superintendents, all principal assistant engineers and assistants to the principal assistant engineers, all division superintendents, all assistant engineers and all supervisors. This inspection covers not only the condition of track, but also all the structures and property of the company. One prize of $100 is given for the Main Line yard having the best surface, alinement and general appearance at the time of the inspection. A number of the divisions other than the Main Line divisions have premiums of their own which are awarded after the annual inspection.

The real value of these detailed inspections is in affording a fairly accurate basis for comparison of one year's work with another on the same section of the road, rather than a means of comparison of widely separated sections for any one year. Even in this ,however, allowances must be made at times for wide differences in climatic conditions from year to year, improvements made with special appropriations for rail, ties or ballast, increase or decrease in density of traffic, natural depreciation and many other factors which affect the fairness of marking. It is entirely out of the question to compare the results on one road with those on another.

Railroad Shop Tools.

(Continued.)

BORING MILLS.

The 30-in. boring and turning mill shown in Fig. 1 will take work 32 in. in diameter and 15½ in. high under the cross-rail. The chuck or face plate has eight changes of speed, ranging from 73 r.p.m. to 18 r.p.m. without back gears and from 9.3 r.p.m. to 2.28 r.p.m. with back gears. This machine is furnished with a three-jaw independent and universal chuck combined, or it can be fitted with a plain table, with or without

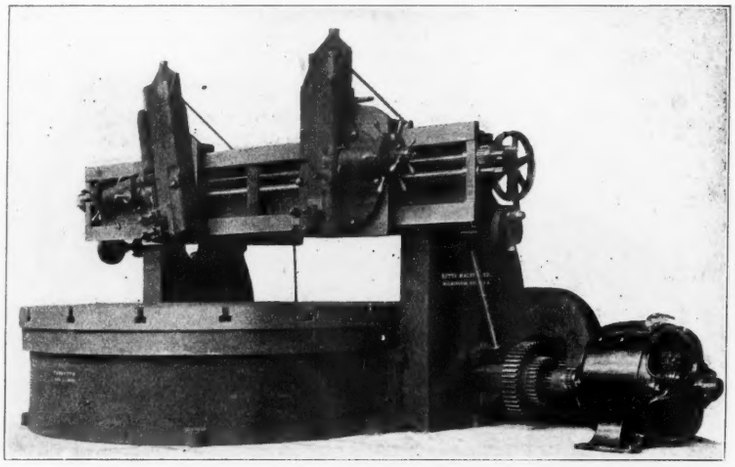


Fig. 2—The Betts 100-in. Boring Mill.

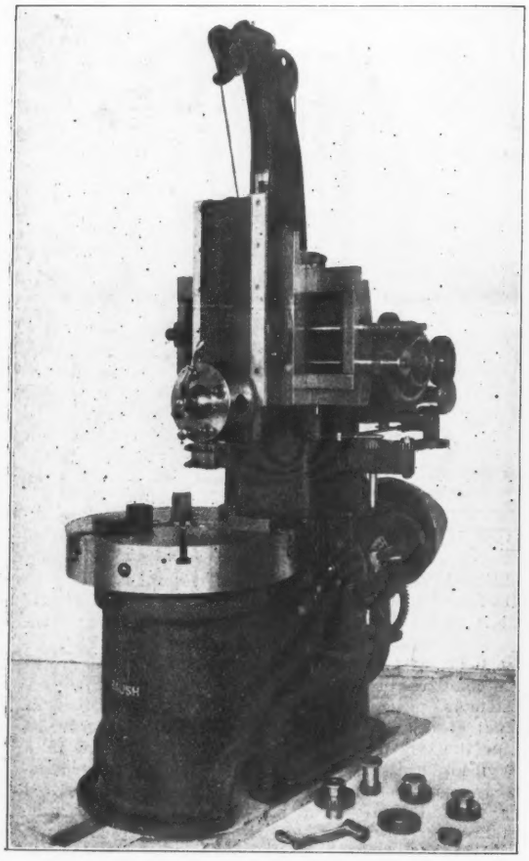


Fig. 1—The Baush 30-in. Boring Mill.

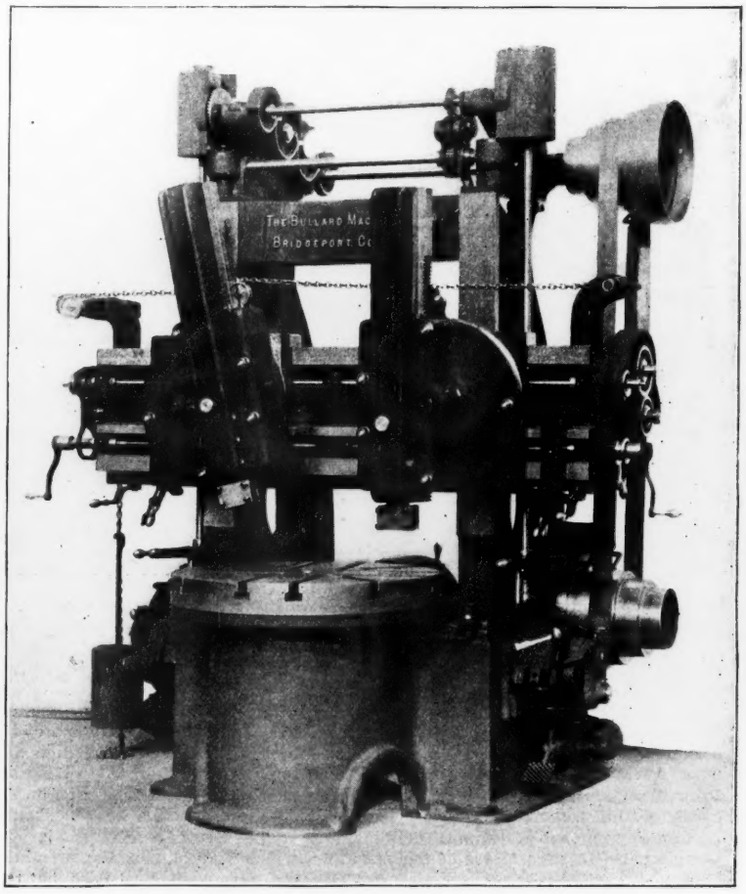


Fig. 3—The Bullard 42-in. Boring Mill.

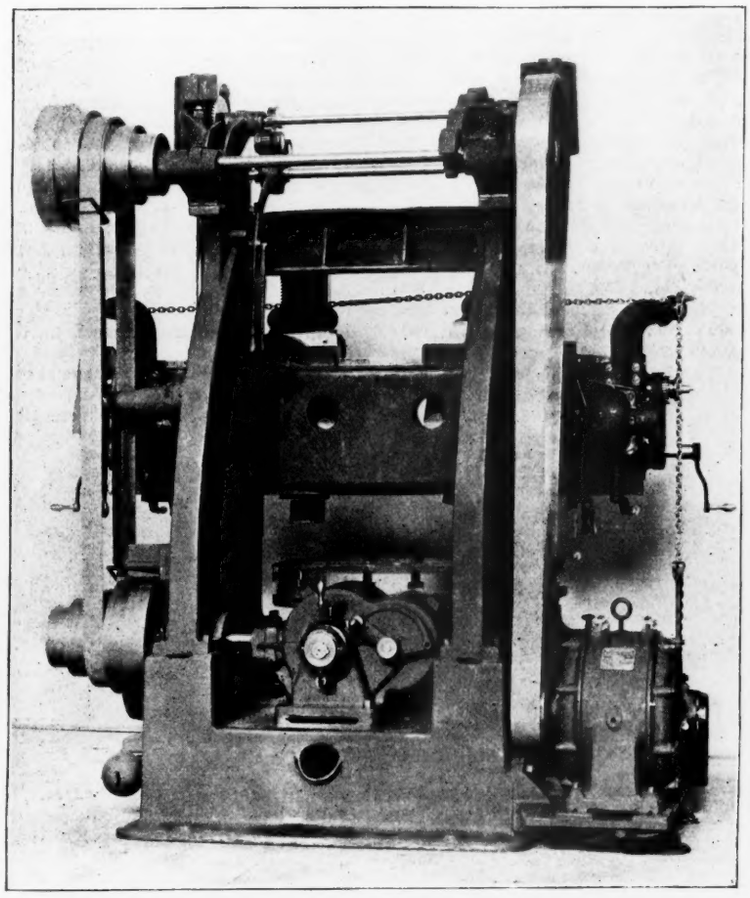


Fig. 4—The Bullard Mill with Motor Mounted on Side Bracket.

jaws. The diameter of the chuck is 30 in. The distance from the floor to the top of the table is 2 ft. 9¾ in. The table has an outer bearing which has an automatic oiling device. The turret slide is attached to a swivel head and has a traverse of 16 in. and can be set to any angle up to 30 deg. By using the Hendy-Norton change gear device attached to the upright the mill will cut the following threads: 6, 7, 8, 9, 10, 12, 14, 16, 18 and 20 threads per inch.

The vertical feed has 20 changes. The horizontal feed has 20 changes, ranging from 0.015 in. to 0.211 in. The mill is driven by a cone, having a 3-in. belt, and it is arranged so that a motor drive may be attached at any time. The back gears are changed by a lever, without the use of a nut lock. The turret has five sides, each of which is 10 in. wide. The holes in the turret head are 2 $\frac{3}{16}$ in. in diameter. The countershaft has a four-step cone, with a tight and a loose pulley, and should run at 200 r.p.m. The Baush Machine Tool Company make this machine. Its weight is 5,500 lbs.

The 100-in. tire turning and boring mill shown in Fig. 2 is made by the Betts Machine Company. This mill is specially designed for rough turning and finishing steel tires, and swings work 104 in. in diameter and 18 in. high under the cross-rail. The table is 100 in. in diameter and has 15 changes of speed. This machine can be driven by a cone and gearing or it may be driven by a motor connected, as shown. The table is mounted on a spindle, the bearings of which have adjustment for wear. There is also an annular bearing on the bed, which is automatically lubricated. The cross-rail has two saddles, made right and left for close work, and either saddle will move to the center for boring. The tool spindles have a traverse of 18 in. They have rapid hand movement and are counterbalanced. The

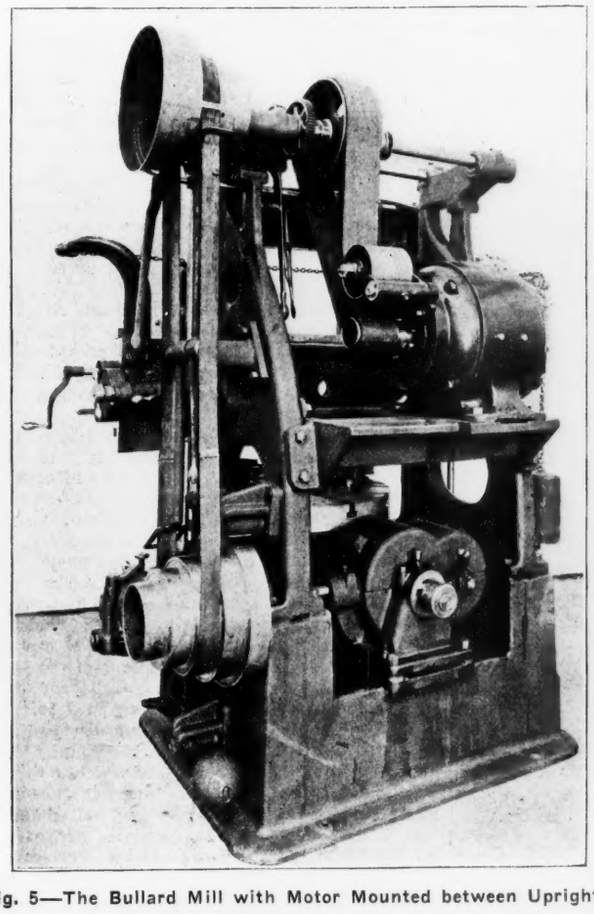


Fig. 5—The Bullard Mill with Motor Mounted between Uprights.

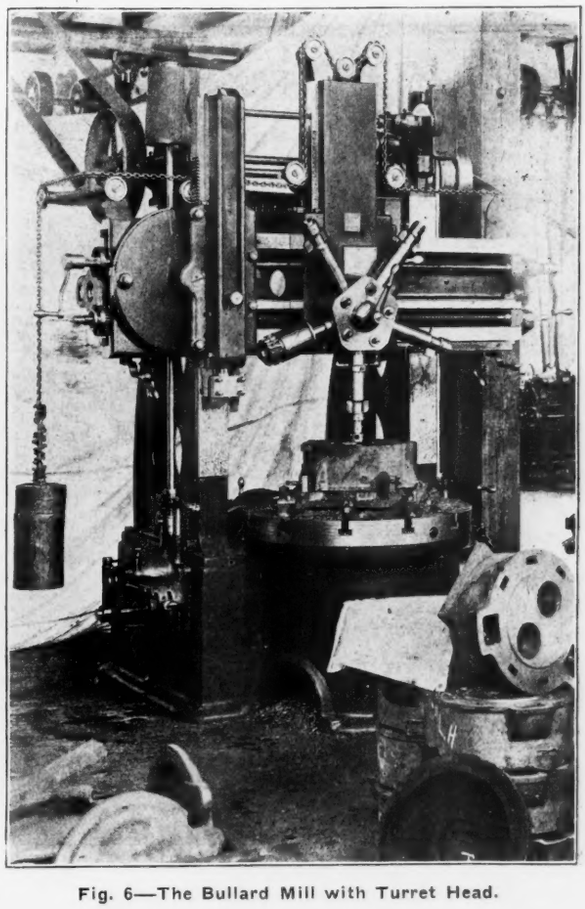


Fig. 6—The Bullard Mill with Turret Head.

swivels are moved by a worm and ratchet for angular adjustment. The feeds are positive and operate at any angle and are entirely independent of each other in all movements. Separate feed mechanism is provided on each side of machine. The changes in feed are made at the ends of the cross-rail by means of slotted feed plates. This mill is self-contained and requires no expensive foundation. The weight is about 39,400 lbs.

The boring and turning mill shown in Fig. 3 is made by the Bullard Machine Tool Company. This machine has a capacity for machining a piece 42 in. in diameter and 33½ in. in height. The table is 37½ in. in diameter and has ten changes of speed. The table spindle is self-centering and the journals are immersed in oil. Each head has a separate feed mechanism, thus making the heads independent in their movements, both as to direction and amount of feed. Either head can be brought to the center for boring. A quick power traverse operates the heads in all directions. The machine is constructed so that it is impossible for the quick power device to be thrown in at the same time with the feed. The left-hand head can be set at any angle and has a downward movement of 30 in. The right-hand head is arranged for cutting all standard threads from 2½ to 12 per inch, including 11½ threads per inch. The screw-cutting gears on the head are independent of the feed gears. The illustration shows the machine with two swivel heads, but the machine can be provided with one swivel head and one turret head if desired. The turret has five sides, each of which is 10 in. wide. The holes in the turret head are 2½ in. in diameter. The slide has a vertical movement of 24 in. Each feed is positive and has ten changes, ranging from $\frac{1}{32}$ to ¾ of an in. horizontally, and from $\frac{1}{64}$ to ½ in. in angular and vertical directions. The cross-rail is raised and lowered by power. The cone has five steps for a 3-in. belt, the largest diameter being 19 in. The table may be stopped at any point by means of a brake attached to the right-hand side of the machine. All the high-speed journals are bronze bushed and self-oiling. Two methods of motor drive are shown. Fig. 4 shows the method of applying a motor on a bracket at the side of the mill, while Fig. 5 shows a constant speed motor mounted on a bracket placed between the uprights. In this case a clutch is introduced into the line shaft to enable the starting and the stopping of the machine without affecting the motor. Fig. 6 shows the application of the turret head.

The 42-in. car wheel boring machine, Fig. 7, is made by the Niles-Bement-Pond Company. This machine will bore wheels up to 42 in. in diameter on the thread. The table is 48 in. in diameter and is fitted with a self-centering chuck, which can be operated by a single motion of a cam lever. The chuck jaws are prevented from slipping by engaging with corrugations in the chuck slides. The slides are graduated in inches, and the jaws can be set at any point on the slide, thus enabling the quick chucking of all diameters of wheels. The boring spindle has power down-feeds and quick hand movement. Two fine feeds are provided for roughing out and one coarse feed for finishing cuts. A quick- acting power crane is mounted on the side of the mill for handling the wheels. The power hub-facing-bar passes through the column. It carries an adjustable tool-slide at its end, and is supplied with power feeds and hand movements. A 15-h.-p. motor operates the driving and feed mechanism and a 2½-h.-p. motor is supplied for operating the crane.

(To be continued.)

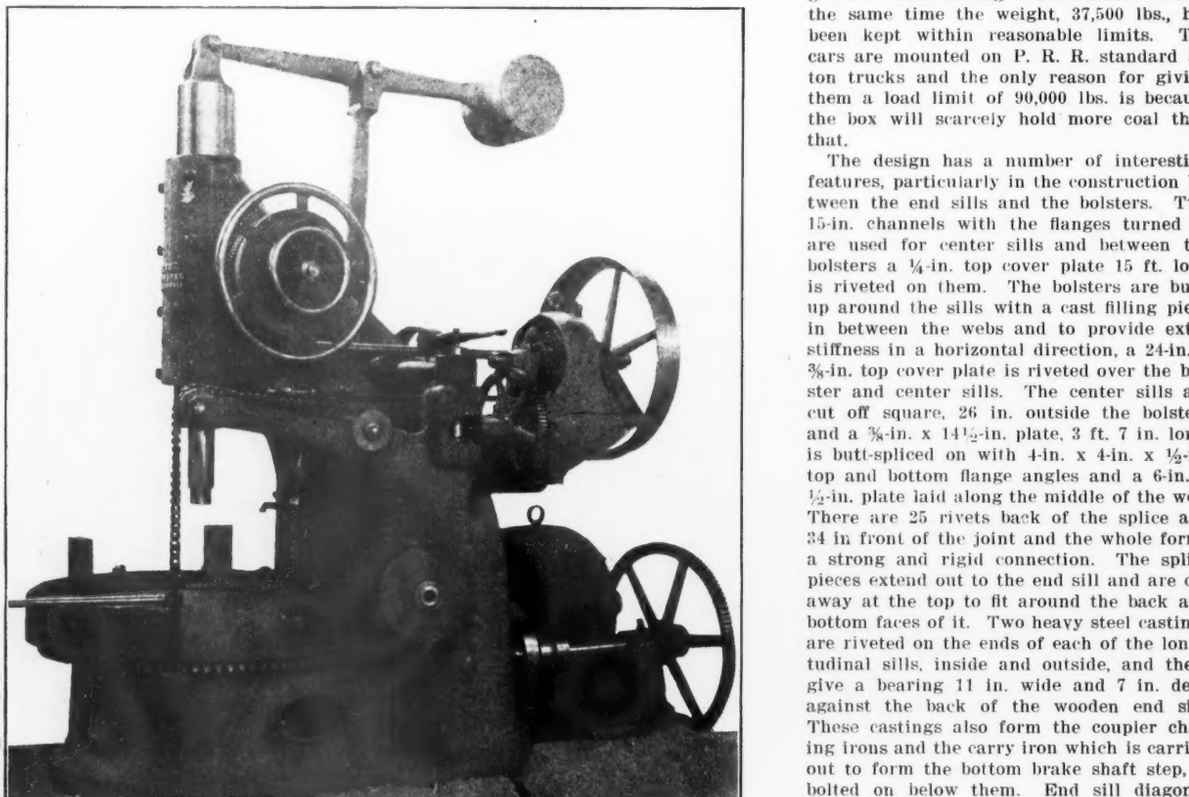


Fig. 7—The Niles-Bement-Pond 42-in. Car Wheel Boring Machine.

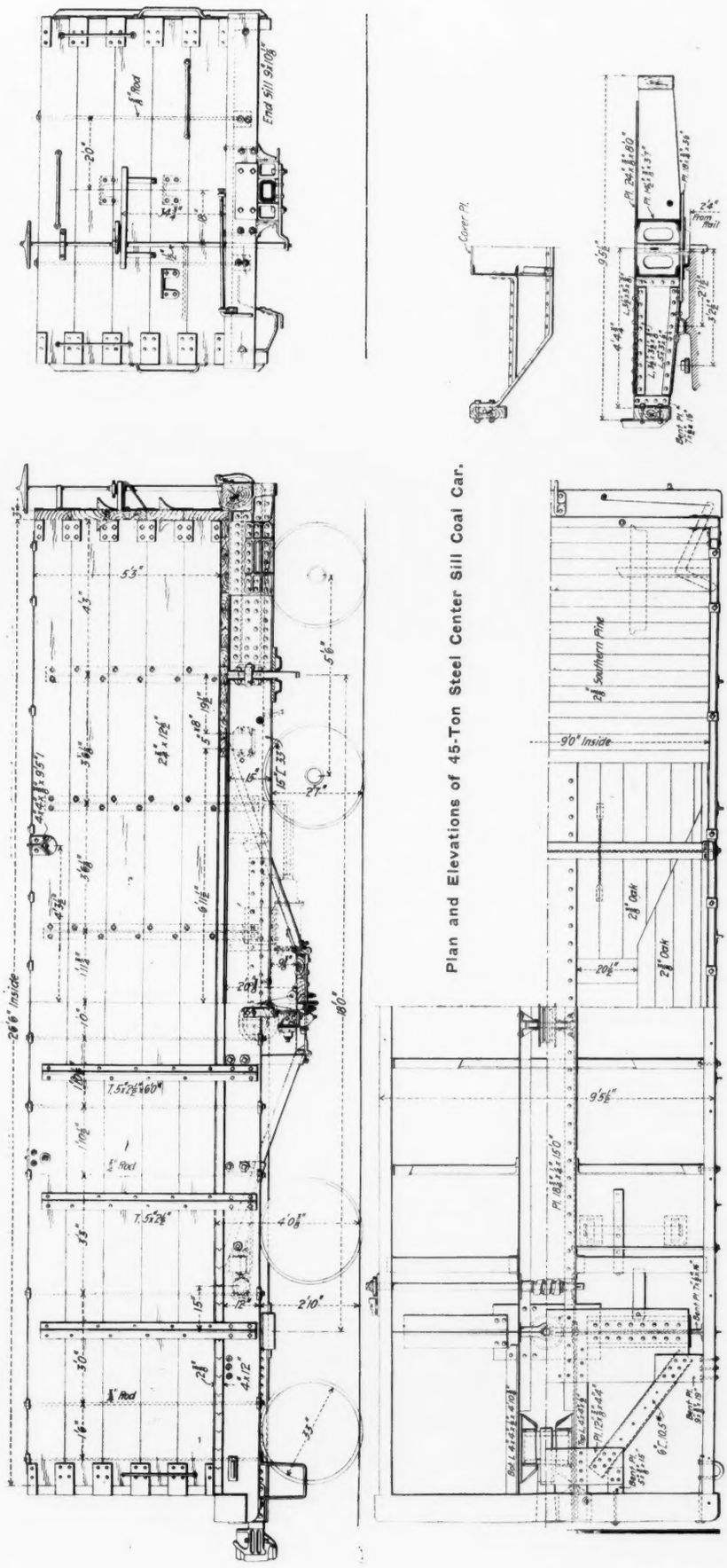
Composite Steel Underframe Coal Car.

The accompanying illustrations show a design of steel center sill coal car of 45 tons capacity, 25 of which have recently been

Steel Center Sill Coal Car.

built for the Bulah Coal Company by the Middletown Car Works, Middletown, Pa. It is a car similar in every way to the Pennsylvania type G. N. car with the exception that steel channels have been substituted for wood in the center sills and 4-in. x 12-in. side sills have been used instead of 4-in. x 10-in. timbers, as in the Pennsylvania car. This gives a much stronger underframe and at the same time the weight, 37,500 lbs., has been kept within reasonable limits. The cars are mounted on P. R. R. standard 50-ton trucks and the only reason for giving them a load limit of 90,000 lbs. is because the box will scarcely hold more coal than that.

The design has a number of interesting features, particularly in the construction between the end sills and the bolsters. Two 15-in. channels with the flanges turned in are used for center sills and between the bolsters a ¼-in. top cover plate 15 ft. long is riveted on them. The bolsters are built up around the sills with a cast filling piece in between the webs and to provide extra stiffness in a horizontal direction, a 24-in. x ⅜-in. top cover plate is riveted over the bolster and center sills. The center sills are cut off square, 26 in. outside the bolsters and a ⅜-in. x 14½-in. plate, 3 ft. 7 in. long, is butt-spliced on with 4-in. x 4-in. x ½-in. top and bottom flange angles and a 6-in. x ½-in. plate laid along the middle of the web. There are 25 rivets back of the splice and 34 in front of the joint and the whole forms a strong and rigid connection. The splice pieces extend out to the end sill and are cut away at the top to fit around the back and bottom faces of it. Two heavy steel castings are riveted on the ends of each of the longitudinal sills, inside and outside, and these give a bearing 11 in. wide and 7 in. deep against the back of the wooden end sill. These castings also form the coupler chafing irons and the carry iron which is carried out to form the bottom brake shaft step, is bolted on below them. End sill diagonal braces made of 6-in. channels are carried back to the outer ends of the bolsters and all of the connections are made with wide,



heavy gusset plates. The heavy end shocks which exceed the capacity of the twin draft springs are taken through the shoulder on the back of the head of the coupler through the end sills to the center sills, almost in line with the neutral axis of the sills, so that no serious bending or buckling strains are induced.

The bottom of the car forms a shallow pyramidal hopper with double drop doors operated with a double chain running back between the center sills to the operating shaft, which is placed just back of the bolster at one end of the car. On the plan of the car will be noticed a bell crank attached under the floor for transforming the motion of the hand-brake chain from a lateral to a longitudinal direction. A noticeable feature of the design of the steel underframe is the absence of any pockets or depressions in which acidulated water might collect and cause corrosion.

We are indebted to Mr. George I. King, Vice-President and General Manager of the Middletown Car Works, for the illustrations.

Seventeen Passengers Killed at Glenwood, Ill.

In a rear collision on the Chicago & Eastern Illinois, at Glenwood, Ill., 23 miles south of Chicago, on the evening of July 13, about 8 o'clock, 17 or more passengers were killed and about 60 were injured, all members of a Sunday school excursion returning to Chicago. The excursion train of 12 cars was running on the southbound track, having been put upon that track to get it around a delayed northbound freight. This freight had broken in two, and the forward portion, consisting of the engine and 30 cars, had been set upon the southbound track to be rejoined to the rear portion, and while moving slowly *northward* was struck by the passenger train at full speed on a curve. The baggage car and first two passenger cars were completely crushed. The stations, going north, are: Chicago Heights, Glenwood, 3.2 miles, and Thornton, 1.7 miles farther. The freight, northbound, broke in two before reaching Chicago Heights. The engine and 30 cars were run to Thornton, backed across to the southbound track and run back to Glenwood, and the rear end of this 30-car section had been pushed about 1,000 ft. south of Glenwood station when the collision occurred, the passenger train having been sent north from Chicago Heights on the west or southbound track, the rear part of the freight having been stopped at or near Chicago Heights. It would seem that Engineman Hoxie of the freight set back from Thornton by reason of some misunderstanding with the conductor, he (the conductor) having gone north to flag the southbound track. An order had been given to set the 30 cars on the siding at Thornton, there being considerable upgrade southward and the southbound track had to be crossed to do this. Why the cars were not set off has not yet been explained. Neither is it clear how Hoxie could start southward when the despatcher had, presumably, put out an order at Thornton to hold all southbound trains for the northbound excursion train. There was no operator on duty at Glenwood. For a satisfactory statement of the cause, therefore, it will be necessary to await further information.

About 20,000 men engaged in railroad construction partly in Galicia (Austrian Poland) and partly in Hungary, agreed to strike April 30. Those working in Hungary were arrested while trying to cross over the border. The Galicians were not willing to strike alone, and the movement then ended.

Water Filters for Railroad Use.

There are many waters which are comparatively soft and would be classed as good waters as far as hardness is concerned. Such waters, however, often contain 300 gr. of solid matter per gallon, especially during freshets. About 200 lbs. of sediment may be deposited in the boiler in an ordinary day's work. This suspended matter is a mineral consisting of clay, which is an impure silicate of alumina, or silt, which is a combination of silica oxide, iron, lime, etc. These foreign substances are accompanied by mud, and a carbonaceous, organic mixture, more or less soluble. The minerals are deposited in the boiler with the scale, and gives it a heterogeneous composition, often stratified and tough. A pure mineral scale is generally brittle. The mud, however, is lighter and remains mostly in suspension, except where the circulation is poor, such as the water leg, where it deposits and becomes baked, causing the sheets to bag and burn out. The mud, which remains in suspension, often produces foaming, especially if much saline matter is present.

It is with such waters that filtration proves most advantageous, although it may be said that no water should contain more than 350 parts per million (20 gr. per gallon) of suspended matter. Such a water would be quite milky or opalescent, but never "roily" or brown. Filtration, with the use of a coagulant such as sulphate of alumina, removes all suspended matters, color and stain, and a large portion of the dissolved organic matter, delivering the water perfectly clear without materially affecting the dissolved mineral constituents.

The Chicago & Eastern Illinois is about to install at Villa Grove, Ill., on the Embarras River, a filtration plant having a capacity of from 400,000 to 500,000 gals. of water per day of 24 hours. An illustration of the filter, which is made by the New York Continental Jewell Filtration Company, is shown. It is 8 ft. in diameter and 24 ft. outside. The inner tank, which is rectangular, is 6 ft. 4 in. wide x 25 ft. 4 in. long, giving an effective filtration surface of 153 sq. ft. The filter bed, which is contained in the inner tank, is ground flint rock, carefully sifted to a uniform size. The depth of this bed is 3 ft. At the bottom of the filter bed is a system of manifolds and branch pipes, the former extending the entire length of the tank and the latter to either side from the center. Into these pipes are screwed several hundred strainers of a special design, adapted to draw off freely the water which comes down through the bed, and prevent the escape of the quartz particles. The muddy water enters at the central connection in front and is deflected so as to pass below the inner tank. It then rises in the space around the tank, or between the two tanks, and descends through the quartz bed. When the water reaches the strainers it is perfectly clear and runs along the manifold to the lower opening in front, whence it is delivered to the storage tank.

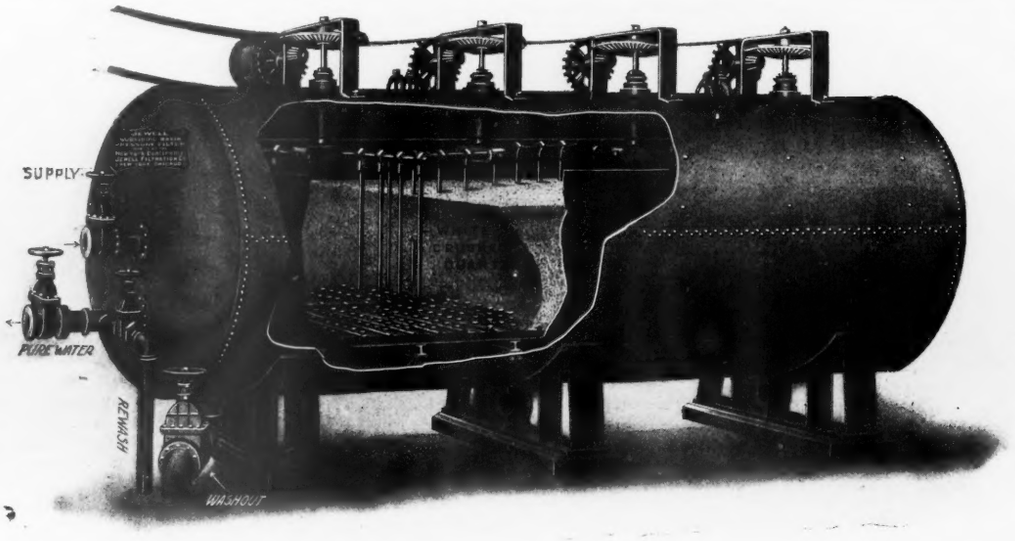
It is necessary to clean the filter on an average once a day, depending, of course, on the turbidity of the water, which varies. This operation requires from 10 to 15 minutes and is very thorough, leaving the bed clean and white. A 4-h.-p. vertical steam engine is used to operate the "agitators" during washing and serves to revolve the perpendicular bars, or rakes, through the bed. This thoroughly agitates the bed, so that the grains are rubbed together and the sediment washed off. In order to make these bars revolve easily and carry away the heavy sediment, which is then, of course, very concentrated, a reverse current of water is applied to the strainer system. This water comes back by gravity from the storage tank and being filtered, does not clog up or wear out the strainers as the river water would do if applied for washing. The upward current thus established is sufficiently strong to expand the bed about 4 in. in height. This expansion of the bed separates the minute grains of quartz by a layer of water and keeps them dancing up and down, so that the agitator bars pass through the bed almost as easily as if no quartz was there.

Much of the heavy matters carried by the river water, such as the silt, clay, etc., settles in the "subsidence basin" (the space between the two tanks). The rest is carried over on the bed and lodges principally on the surface, only the very lightest and finest penetrating it to any appreciable extent; therefore, when the wash-out valve is opened the first to leave is the matter deposited by the settling, and also the first water to leave the quartz carries the top layer of sediment off the filter bed, so that very little water—approximately 2 to 3 per cent. of the amount filtered—is required for washing. As the wash water overflows the inner tank it serves also to wash out the subsidence basin in one operation.

The filter shell is built of heavy steel plate, double riveted, to stand 100 lbs. per sq. in. The pipe connections on this size filter are 6 in. for the supply and discharge connections and 8 in. for the washout. The rewash, or draining, pipe, which is seldom used, is 4 in. During filtering the quartz particles settle down very compactly, leaving a perfectly level and solid filtering surface. The initial resistance of the filter bed during filtering is just about equal to 1 lb. pressure per square inch. During filtering as the sediment accumulates, this gradually increases and may run up to 10 or 15 lbs., although it is generally most econominal to wash the filter before it reaches 5 to 6 lbs. This resistance and condition of the bed is readily observed by two ordinary pressure gages, one on the supply pipe and the other on the discharge of the filter. The gage on the discharge pipe also serves to show when sufficient water is turned on for washing and enables the operator to set the valve at the proper opening. Too much back pressure during washing would cause a gradual waste of the quartz and would not be economical in the relative percentage of wash to filtered water. Only enough water is turned back to liquefy the bed and relieve the engine of any heavy load. The engine and agitators are not moved during filtering, and are, therefore, used only a few minutes each day.

The apparatus is practically indestructible, as it is subject to very little wear. The only vulnerable parts are the strainers and the quartz filter bed. Strainers have been in use now over 12 years on a filter installed for this road at Brazil, Ind., and strainers removed from filters in operation over six years, for purposes of examination, were found only slightly worn. The loss of the quartz should not exceed 3 per cent. of its volume per year (ordinary wear), but if care is not exercised in the matter of wash water pressure and speed of agitators during washing, the loss may be as high as 10 per cent. These conditions have been safeguarded as far as practicable by proportioning the size of the pipe connections, openings in the strainers and automatic governing of the engine.

The filters are easily erected and may be moved from one station to another without



Filter for Chicago & Eastern Illinois at Villa Grove.

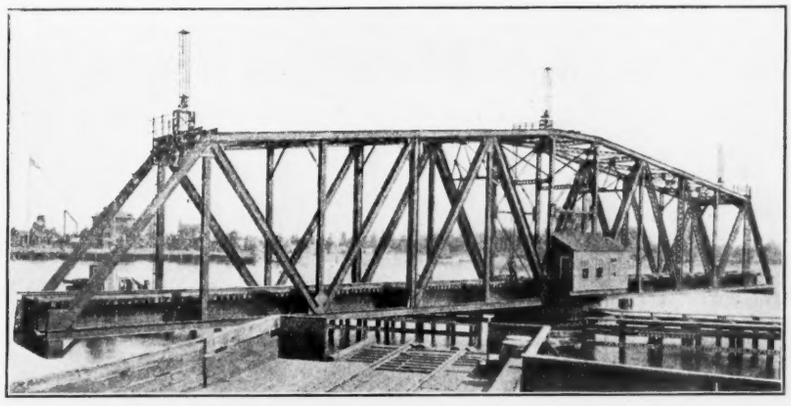
being taken apart. For large equipments, exceeding 500,000 gals. per day, a battery of two or more smaller sizes is used.

Among the railroads using these filters are the Chicago & Eastern Illinois, Chicago, Milwaukee & St. Paul; Michigan Central, Illinois Central, Southern Pacific, Reading Terminal (Philadelphia) and the Missouri Pacific.

The St. Joseph Drawbridge of the Pere Marquette.

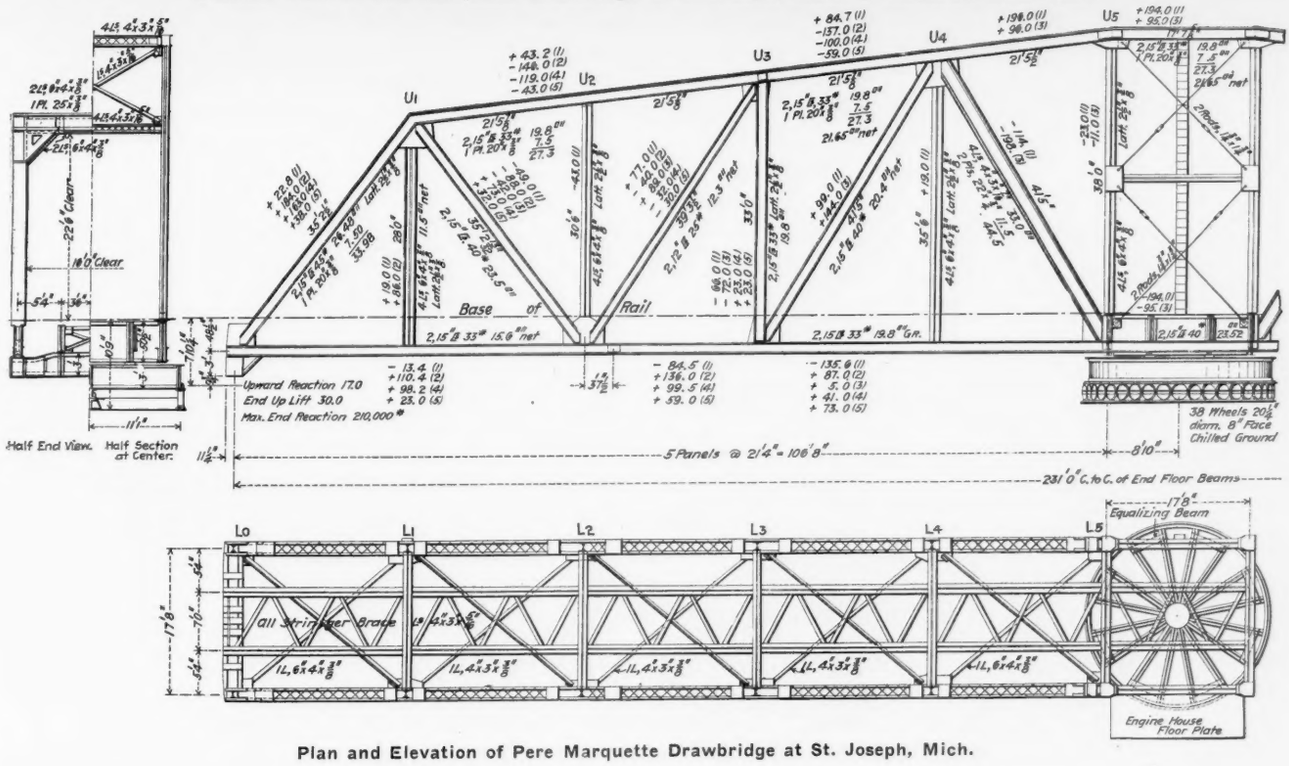
The Pere Marquette has recently completed and put in service a new drawbridge across the St. Joseph River at St. Joseph, Mich., replacing an older span which had become too light for modern locomotives. The latter was built in 1887 by the Detroit Bridge & Iron Works and was 231 ft. 4 in. center to center of end piers, giving two 100-ft. clear openings. Quick work was done in putting up the new structure, the old bridge having been withdrawn from service on February 28 and the new one swung into place on March 27. It was necessary to have the new bridge ready for the passage of boats when navigation opened, and the first large boat passed through the draw on the evening of March 28. The contract for the bridge was let December 20, 1903.

To provide for railroad traffic during the progress of the work, piles were driven for a temporary trestle in the north opening and a temporary draw span, to permit the passage of small boats, was put in the south opening. This span was made of two old 45-ft.



New Drawbridge of the Pere Marquette at St. Joseph, Mich.

Erection View of Pere Marquette Drawbridge at St. Joseph, Showing Temporary Draw Span.



Plan and Elevation of Pere Marquette Drawbridge at St. Joseph, Mich.

plate girder spans riveted together end to end with cover plates, and was placed on a turntable center resting on a pile pier. It was opened and closed by means of ropes leading to winches on the protection pier. Four or five movements a day were all that were required during the three weeks or so that this span was in use. The old bridge having been swung around on the protection piers and the diagonals of the center panel taken out to permit the passage of trains, the steel work was taken down and the new structure erected on this pier.

The new bridge is 231 ft. center to center of end floor beams, 17 ft. 8 in. center to center of trusses and 38 ft. center to center of chords at the middle panel. The clearance is 22 ft. 6 in. It was designed for Cooper's Class E loading. The longitudinal and transverse girders are 5 ft. ½ in. back to back of angles, and the intermediate floor beams are 4 ft. 6½ in., the end floor beams 3 ft., the stringers 3 ft. 2½ in. and the equalizing beams 3 ft. in this same dimension. The weight of the new bridge is 300 tons, that of the old one having been 140 tons. The new bridge is operated by a 30-horsepower, gasoline engine, which opens or closes it in one minute. The bridge was built at the Detroit plant of the American Bridge Company.

The foregoing information and photographs were furnished by Mr. J. Tuthill, Bridge Engineer of the Pere Marquette.

A Novel Flue-Rattler.

The accompanying illustration shows a flue-rattler used at the Elizabethport shops of the Central Railroad of New Jersey. It consists of a semi-circular trough 5 ft. in diameter and 21 ft. 8 in. long, made up of $^{9}/_{16}$-in. boiler plates. It rests on a concrete support, as shown. In this trough is suspended the flue rumbler, which is 3 ft. 3⅜ in. in diameter and is supported at each end by 9 in. x 5 in. bearings. The power for driving is obtained from the main shaft in the boiler shop by a belt. The belt drives a 36 in. pulley, which is on the same shaft with a small gear. This gear meshes with a larger gear keyed to the driving shaft of the rumbler. The machine is operated as follows: Water flows into the trough from the pipe shown in the illustration. When the trough is partially filled the water is shut off. The water is then heated by turning steam into the trough from a steam pipe provided for the purpose. The water is heated in order to shorten the time required for cleaning the tubes and to prevent the water from freezing in winter, as the rattler is outdoors. The water is let out of the trough before the tubes are removed. It took about 8 hours to clean 125 tubes using the old-style dry rattler, but with the above design 125 flues are thoroughly cleaned in 2½ hours. Enough heat is retained in the tubes from the hot water to dry them quickly after being taken out of the rumbler and stood on end. In addition to saving time, the advantages of the water flue rattler are: Little noise; the flues do not have to be dried out before rattling as in a dry rattler, and the tubes are thoroughly cleaned.

Locomotive Testing Plant of the Pennsylvania at St. Louis.*

Methods Used in Tests.

A list of items, comprising the observed and calculated results, which have been approved by the Advisory Committee is given below: It is divided into seven general headings: (1) Description, Dimensions and Proportions, (2) Constants, (3) Observed Data, (4) Summary of Average Results—Boiler, (5) Summary of Average Results—Engine, (6) Summary of Average Results—Locomotive, (7) Summarized Statement of Average Results.

All of the items given under heading "Summarized Statement of Average Results" are contained in earlier statements, but are here grouped together, thus giving in a condensed form the most important facts.

DESCRIPTION, DIMENSIONS AND PROPORTIONS.

Driving Wheels.

1. Number of pairs.
2. Approximate diameter, inches.
3. Measured circumference, feet, Right No. 1...
4. " " " " " 2...
5. " " " " " 3...
6. " " " " " 4...
7. " " " " " 5...
8. " " " Left " 1...
9. " " " " " 2...
10. " " " " " 3...
11. " " " " " 4...
12. " " " " " 5...
13. Average .....

Engine Truck Wheels.

14. Number
15. Diameter, inches.

Trailing Wheels.

16. Diameter, inches.

Wheel Base.

17. Driving wheel base, in feet.
18. Total wheel base in feet.
19. Gage of wheels, in inches.

Weight of Engine, Pounds.

(With water at second gage cock and normal fire.)

20. On truck
21. On first drivers.
22. On second drivers.
23. On third drivers.
24. On fourth drivers.
25. On fifth drivers.
26. On trailers
27. Total
28. Total on drivers.

Cylinders.

29. High pressure, number.
30. Low pressure, number.
31. Arrangement
32. Diameter, inches, high pressure, right.
33. Diameter, inches, high pressure, left.
34. Diameter, inches, low pressure, right.
35. Diameter, inches, low pressure, left.

Stroke of Piston, Feet.

36. High pressure, right.
37. High pressure, left.
38. Low pressure, right.
39. Low pressure, left.

Clearance, Per Cent. of Piston Displacement.

40. High pressure, right, head end.
41. High pressure, right, crank end.
42. High pressure, left, head end.
43. High pressure, left, crank end.
44. Low pressure, right, head end.
45. Low pressure, right, crank end.
46. Low pressure, left, head end.
47. Low pressure, left, crank end.

Receiver, Cubic Feet.

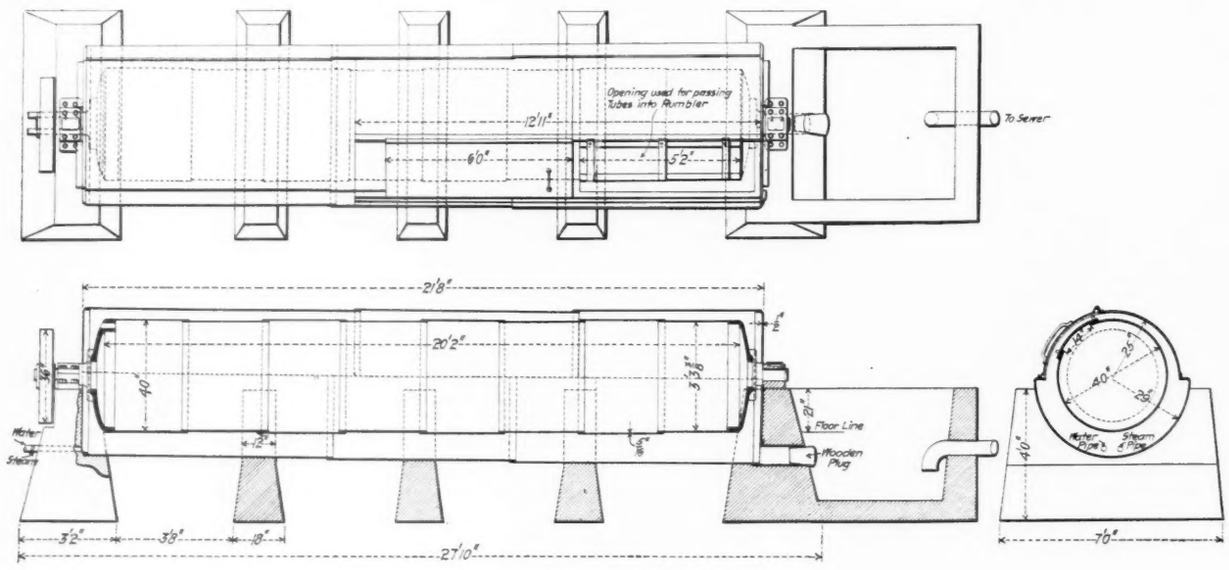
48. Volume, right side.
49. Volume, left side.

Steam Ports, Inches.

(For piston valves, the length equals the circumference of inside of bushing, minus the sum of the widths of bridges.)

50. High pressure admission, right, head end, length
51. High pressure admission, right, head end, width
52. High pressure admission, right, crank end, length
53. High pressure admission, right, crank end, width
54. High pressure admission, left, head end, length
55. High pressure admission, left, head end, width
56. High pressure admission, left, crank end, length
57. High pressure admission, left, crank end, width
58. Low pressure admission, right, head end, length
59. Low pressure admission, right, head end, width
60. Low pressure admission, right, crank end, length
61. Low pressure admission, right, crank end, width
62. Low pressure admission, left, head end, length
63. Low pressure admission, left, head end, width
64. Low pressure admission, left, crank end, length
65. Low pressure admission, left, crank end, width
66. High pressure exhaust, right, length.
67. High pressure exhaust, right, width.
68. High pressure exhaust, left, length.
69. High pressure exhaust, left, width.

*From Bulletin No. 3, published by the Pennsylvania Railroad Company.



Flue-Rattler—Elizabethport Shops, C. R. R. of N. J.

70. Low pressure exhaust, right, length.....
71. Low pressure exhaust, right, width.....
72. Low pressure exhaust, left, length.....
73. Low pressure exhaust, left, width.....

Piston Rods, Diameter, Inches.

74. High pressure, right.....
75. High pressure, left.....
76. Low pressure, right.....
77. Low pressure, left.....

Tail Rods, Diameter, Inches.

78. High pressure, right.....
79. High pressure, left.....
80. Low pressure, right.....
81. Low pressure, left.....

Valves.

82. Type .....
83. Design .....
84. Balanced area in per cent. of total.....
85. Type of link motion.....

Greatest Valve Travel, Inches.

86. High pressure, right.....
87. High pressure, left.....
88. Low pressure, right.....
89. Low pressure, left.....

Outside Lap of Valve, Inches.

90. High pressure, right, head end.....
91. High pressure, right, crank end.....
92. High pressure, left, head end.....
93. High pressure, left, crank end.....
94. Low pressure, right, head end.....
95. Low pressure, right, crank end.....
96. Low pressure, left, head end.....
97. Low pressure, left, crank end.....

Inside Lap of Valve, Inches.

98. High pressure, right, head end.....
99. High pressure, right, crank end.....
100. High pressure, left, head end.....
101. High pressure, left, crank end.....
102. Low pressure, right, head end.....
103. Low pressure, right, crank end.....
104. Low pressure, left, head end.....
105. Low pressure, left, crank end.....

Miscellaneous.

106. Cylinder lagging, material.....
107. Cylinder jacket material.....
108. .....
109. .....
110. .....
111. .....
112. .....

Boiler.

113. Type .....
114. Outside diameter, first ring, inches.....

Tubes.

115. Number .....
116. Outside diameter, inches.....
117. Thickness, inches .....
118. Length between tube sheets, inches.....
119. Total fire area, square feet.....
120. Serve tubes, number of ribs.....
121. Serve tubes, square inches of inside surface in one inch of length.....
122. .....
123. .....
124. .....

Superheater.

125. Number of tubes.....
126. Outside diameter, inches.....
127. Thickness, inches.....
128. Length of tubes, inches.....
129. .....
130. .....
131. .....

Fire-box, Inside.

132. Length .....inches.....
133. Width .....inches.....
134. Depth, front end.....inches.....
135. Depth, back end.....inches.....
136. Volume .....cubic feet.....
137. .....
138. .....
139. .....
140. .....

Fire Doors.

141. Number .....
142. Area, square feet.....
143. .....

Grates.

144. Style .....
145. Total area, square feet.....
146. Total area, dead grates, square feet.....
147. Width of air spaces, inches.....

Air Inlets.

148. Through fire-box sides.....Square feet
149. Through grates.....Square feet
150. Through fire doors.....Square feet
151. Total air inlets, No. 148, No. 149 and No. 150.....Square feet
152. Ratio air inlets (No. 149) to grate area (No. 145) .....
153. Ratio air inlets (No. 151) to grate area (No. 145) .....

Heating Surface, Square Feet.

154. Of the tubes, water side.....
155. Of the tubes, fire side.....
156. Of the fire-box, fire side.....
157. Of the superheater, fire side.....
158. Total, based on inside of fire-box and inside of tubes.....
159. Total, based on inside of fire-box and outside of tubes .....

Boiler Volumes.

(With water surface at level of second gage cock).
160. Water space, cubic feet.....
161. Steam space, cubic feet.....

Exhaust Nozzle.

162. Double or single.....
163. Dimensions of right side, inches.....
164. Dimensions of left side, inches.....
165. Area of right side, square inches.....
166. Area of left side, square inches.....
167. Total area, left side.....

Reverse Lever.

168. High pressure cylinder, notches forward of center .....
169. Low pressure cylinder, notches forward of center .....
170. .....

Ratios.

171. Heating surface (No. 158) to grate area (No. 145) .....
172. Fire area through tubes (No. 119) to grate area (No. 145).....
173. Fire-box heating surface (No. 156) to grate area (No. 145).....
174. Tube surface (No. 155) to fire-box heating surface (No. 156).....
175. Fire-box volume (No. 136) to grate area (No. 145) .....
176. .....
177. .....
178. .....

CONSTANTS.

179. For dynamometer horse-power (power developed when the sped is one r. p. m. and the pull is one pound).....
For indicated horse-power (power developed at one r. p. m. and one pound m. e. p.).
180. High pressure cylinder, right, head end.....
181. High pressure cylinder, right, crank end.....
182. High pressure cylinder, left, head end.....
183. High pressure cylinder, left, crank end.....
184. Low pressure cylinder, right, head end.....
185. Low pressure cylinder, right, crank end.....
186. Low pressure cylinder, left, head end.....
187. Low pressure cylinder, left, crank end.....

For Piston Displacement, Cubic Feet.

188. High pressure cylinder, right, head end.....
189. High pressure cylinder, right, crank end.....
190. High pressure cylinder, left, head end.....
191. High pressure cylinder, left, crank end.....
192. Low pressure cylinder, right, head end.....
193. Low pressure cylinder, right, crank end.....
194. Low pressure cylinder, left, head end.....
195. Low pressure cylinder, left, crank end.....

The numbered blank spaces are provided so that information concerning unusual features of the locomotive under test may be inserted. The dimensions and constants will be given for each locomotive tested, the observed data and calculated results for each test. There will be from fourteen to twenty tests on each locomotive.

The method for obtaining the dimensions and data given is in most cases self-evident; but that these may be clearly understood, and also to show the precautions taken to insure accuracy, the following are deemed sufficiently important to require special mention:

DESCRIPTION, DIMENSIONS AND PROPORTIONS.

Items Nos. 3 to 13. The circumference of the driving wheels will be measured with a flexible steel tape, divided in feet, and hundredths of a foot. The circumference will be taken at the point where the driver would rest on the rail. The gage of track being 4 ft. 8½ in. and the width of the rail head being 2¼ in., the distance between the circumferences to be measured is 4 ft. 10¾ in.

Items Nos. 20 to 28. As there is no scale at St. Louis with sufficient capacity to weigh many of the locomotives which are to be tested, the locomotive will be weighed at the most convenient point by a member of the testing force, although in some cases it may be necessary to take the builders' weights of the engine in working order.

Items Nos. 32 to 35. The diameters of cylinders will be taken with an inside micrometer caliper, at the head end, crank end and middle of the bore of the cylinder. These three locations in the cylinder will be measured with the calipers in a vertical position, and also in a horizontal position; the diameter given being an average of the six measurements obtained in this manner.

Items Nos. 36 to 39. The locomotive being set on one of its dead centers, the distance from some convenient point on the guides or cylinder to some point horizontally in line on the cross-head or piston rod will be measured. A similar measurement will then be taken between the same two points with the locomotive on the other dead center. The difference between these two measurements in feet will give the stroke.

Items Nos. 40 to 47. The volume of clearance will be obtained by placing the locomotive on the dead center and filling the clearance space with water from a vessel holding a known weight of water. The water remaining in the vessel will be weighed and the rate of leakage from the clearance space observed. From these data the volume of the clearance space can be readily calculated, and 100 times this volume, divided by the volume of piston displacement, will be the result desired. As a check, the clearances will be calculated from measured dimensions and working drawings, but preference will be given to the results obtained by the use of water.

With piston valve engines it will be necessary to place the valve so that it will block the steam port; a tell-tale hole being provided to allow the escape of air and to show the height of the water. By removing a cylinder cock, and using a hand pump, the water may be forced in from below, and the amount ascertained.

Items Nos. 48 to 49. The receiver volumes will be ascertained if practicable in the same manner as the volume of clearances.

Items Nos. 50 to 73. The length of the steam and exhaust ports given will not be the actual length, but will be such a dimension that, multiplied by the actual width, will give the actual area of the port. The measurements are given in this way to allow for the rounded corners usually found in cylinder ports.

Items Nos. 74 to 81. The piston rods and tail rods will be measured at several points by a micrometer caliper. The diameter given for each rod will be the average of all measurements.

Item No. 84. The balanced area of the valve will be the product of the dimensions to inside edges of balance strips or rings; the total area that of the entire face of valve.

Items Nos. 86 to 89. The greatest valve travel will be obtained with the reverse lever in full gear forward, by scribing the valve rod and measuring with a tram.

Items Nos. 90 to 105. The outside and inside laps will be calculated from measurements of valve and valve seat taken while hot, and their relative positions at center of valve travel.

As a set of working drawings will be furnished, the chief purpose of these measurements will be to check the drawings.

Item No. 114. The outside diameter of the first or smallest ring of the boiler will be calculated from the circumference as measured with a flexible steel tape.

Items Nos. 116 and 117. As the thickness and outside diameter of tubes vary considerably after they have been in service, the nominal diameter and specified thickness will be taken.

Item No. 118. The length of tubes, between tube sheets, will be obtained by measuring the length over beads of a number of tubes well distributed and deducting the thickness of tube sheets and beads.

Item No. 119. The total fire area of tubes will be obtained by multiplying the area of cross section of inside of tube by the number of tubes.

Item No. 121. As a factor in obtaining the surface contour of the Serve tubes, a strip of adhesive tape will be pressed into the form of the ribs of the tube or a cast of the same. The length of this tape in inches will equal the square inches of surface in one inch of length.

Items Nos. 126 and 127. The dimensions of superheater tubes will be found in the same way as already described for boiler tubes.

Items Nos. 132 and 133. The length of the fire-box will be measured at the level of the bottom of fire door, and parallel to line of rail, the width being the horizontal distance between side sheets at mid-length.

Items Nos. 134 and 135. The depth of fire-box will be the measured distance (perpendicular to the rail) from grate surface to

crown sheet at front and at back of fire-box.

Item No. 136. The volume of fire-box will be calculated from dimensions of the fire-box above the surface of the grates, and checked from the drawings.

Item No. 147. The width of the air spaces in grates will be, with bar grates, the actual width of the openings; with finger grates, the maximum opening.

Item No.. 149. The area of the air inlets through the grates will be calculated from drawings known to correctly show the grates.

Item No. 150. The air inlet area through fire doors will be the area of dampers or holes in fire door, when dampers are open as far as possible.

Item No. 154. The heating surface of the water side of the tubes will be obtained by multiplying the circumference of the outside of tube, in feet, by the length between tube sheets, in feet, and by the number of tubes.

Item No. 155. The heating surface of the fire side of the tube is to be obtained in a similar manner to Item No. 154, except that the internal diameter of the tube will be used. In the case of Serve tubes the length over the ribs (No. 121) divided by 12 is the circumference in feet.

Item No. 156. The heating surface of the fire-box is the area calculated from measurements of the fire-box sheets, above the level of the grates, less the total fire area of the tubes (No. 119), the area of fire doors (No. 142), and the area of air inlets through sides of fire-box (No. 148).

Item No. 157. In the heating surface of superheater will be included any headers, etc., which may form a part of the true superheating surface.

Items Nos. 158 and 159. The heating surface of the superheater, for a locomotive so equipped, is included in these items; using the fire sides of tubes and headers. The heating surface, based on the fire side, will be used in all calculations in these tests.

Items Nos. 160 and 161. To obtain the volume of water and steam space in the boiler, the locomotive frame will be leveled, and the boiler completely filled with water. The water will be weighed out, down to level of second or middle gage cock; from the weight of water corrected for temperature, the volume of steam space can be calculated. By weighing out the remaining water in the same way the volume of water space will be found.

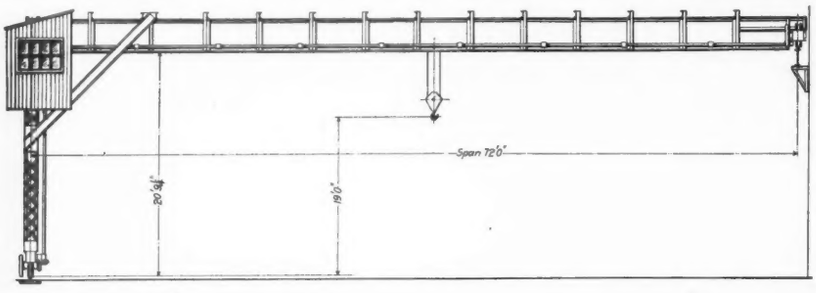
CONSTANTS.

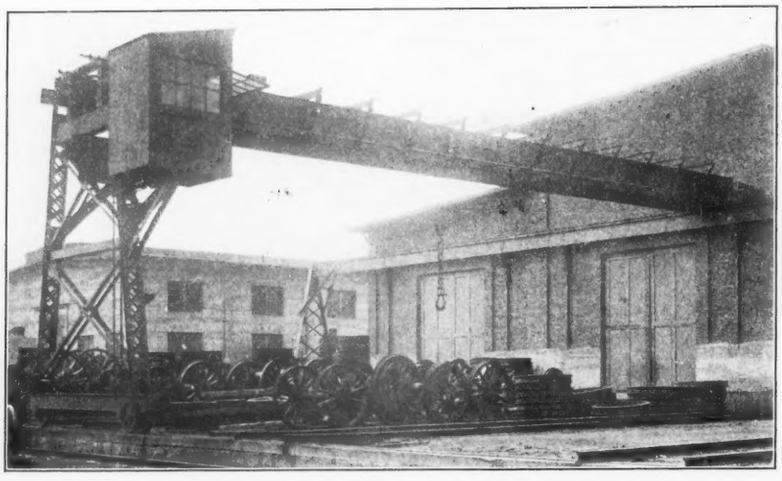
Items Nos. 188 to 195. The piston displacement is the length of stroke multiplied by the difference between the area of the cylinder and the area of the piston rod or tail rod, as the case may be.

(To be continued.)

A Six-Ton Gantry Crane.

The accompanying illustrations show a 6-ton one-leg gantry crane used at the Elizabethport shops of the Central Railroad of New Jersey. The crane is 20 ft. 9¼ in. in the clear and has a span of 74 ft. The present travel of the crane is 112 ft., as it now





A Six-Ton Gantry Crane.

only serves the machine shops, but it is intended to extend its travel so as to make it serve the blacksmith shop also. This will add 144 ft. of track, thus making it available for use over an area of 74 ft. x 256 ft. The end of the crane farthest from the shop wall and adjoining the transfer table pit rests on two legs having a spread of 16 ft. The other end of the crane is carried on brackets secured to the shop wall. The trolley runs on a track which is secured to the lower flanges of the girders. The two girders are stiffened by latticing and the saddle as shown. The truck wheels are chilled iron and are fitted with bronze bushings. The bridge motor is placed on the long leg next to the cab. This is geared to the vertical shafting, so as to bring an equal distribution of the gearing on each side of the motor, which gives an even travel to both ends. The three motions, hoist, trolley travel and bridge travel, are operated by three independent motors. The hoist motor is a 7-h.-p. 240-volt machine, running at 640 r.p.m. and lifting at the rate of 24 ft. p.m. The load is carried on wire rope instead of a chain. The trolley drive motor is a 3-h.-p. 240-volt machine, running at 640 r.p.m. The crane travels at 100 ft. p.m. The crane motor is a 16-h.p. 240-volt machine and runs at 750 r.p.m. The motors are the enclosed type and are made especially for crane service. They are designed so that they will stand a heavy overload without injury. The crane is controlled by three levers in the cab, and in addition there is a foot brake for controlling the travel of the bridge. The hoist is fitted with automatic mechanical and electrical brakes. The trolley is protected from the weather by a roof. Before the crane was installed the transfer table was used for shifting driving wheels and other material for the machine shop. This took up a great deal of time and practically monopolized the use of the transfer table and in consequence the car shop was hampered by constant delays at the transfer table. Since this crane has been installed the car shop has practically the exclusive use of the transfer table, as this crane now handles all of the material for the machine shops rapidly and economically. The shop power house furnishes the current for operating the motors. The builders of this crane are Maris Brothers, Philadelphia, to whom we are indebted for the illustrations.

Pig Iron Production for June.

The *Iron Age* in its report for the month of June shows that the pig iron production during this month was only 1,292,030 tons, as compared with 1,533,350 tons in May, 1,555,267 tons in April, and 1,447,065 tons in March. The total decrease over May was about 240,000 tons, of which 184,000 tons was due to the steel companies and 57,000 tons to the merchant furnaces. On July 1 the number of stacks in blast was 188, as against 213 on June 1. The weekly capacity on July 1 was only 272,301 tons, compared with 336,197 tons on June 1, 368,244 tons on May 1, and 337,357 tons on April 1. The largest falling off in production was in the Mahoning, Shenango and Schuylkill valleys and in the Wheeling, Central and Northern, and Pittsburg districts. Returns from the various plants of the United States Steel Corporation show a total production of 788,822 tons during June, as compared with 927,534 tons in May, 974,006 tons in April, 913,412 tons in March, 756,230 tons in February, and 502,994 tons in January. Merchant stocks, which were declining steadily during the first quarter of the year, continue to show the gains which were first noticeable in the last monthly report. The total number of merchant stocks on hand on July 1 was 620,844 tons, as against 545,892 tons on June 1, and 576,402 tons on January 1. The greater part of this accumulation during the month of June was in the Central Western and Northwestern districts.

The summer time-table of the Siberian railroad shows a regular passenger service only as far east as Irkutsk (3,386 miles from Moscow, from which the express trains start). So far there are four express trains weekly and one daily passenger train. East of Lake Baikal the road is devoted to military traffic. Between St. Petersburg and Moscow a sleeping car was to run once daily (the line has a very heavy passenger traffic, but mostly by day trains) till June 29, then three times a week till August 12; then daily again.

GENERAL NEWS SECTION

THE SCRAP HEAP.

The new White Star steamship Baltic was obliged to sail on her homeward trip last week, loaded to less than her full cargo capacity because her maximum loaded depth of 36 ft. 6 in. is too great to permit her passage through New York harbor.

An order has been given by the Pennsylvania, effective on the most important trains east of Pittsburg and Erie that, while dinners will be served on the table d'hote plan as heretofore, à la carte breakfasts and luncheons will be served The entire service has previously been table d'hote

It is understood that the Pennsylvania will renumber 165,000 freight cars on the lines west of Pittsburg and 115,000 cars east. The 15,000 cars in the company's Union Fast Freight line are also to be included. It is proposed to have certain blocks of numbers for each line on the system, and each class of cars will have a separate block.

The Pere Marquette has made traffic arrangements with the New York Central and the Michigan Central, effective July 18, by which it now has trackage for its freight trains to Suspension Bridge and Black Rock, and for its passenger trains into Buffalo. The company will inaugurate through freight service into the eastern Niagara frontier, using the rails of the Canada Southern to a connection with the New York Central, Erie and Lehigh Valley roads via Suspension Bridge, and to a connection with the Delaware, Lackawanna & Western at Black Rock, using the International Bridge.

The southbound St. Louis-Mexico express of the International & Great Northern was held up by five train robbers near Oakwood, Texas, on July 16. The robbers first attempted to wreck the train by piling ties on the track, but the obstruction was discovered by the engineer in time to prevent an accident. When the train stopped dynamite was exploded under the baggage car and the day coach, the robbers evidently mistaking the baggage car for the express car, which was not injured. Three cars were wrecked, but no one was hurt, except one of the train robbers, who was thought to have been injured by the explosion. The robbers escaped after the explosion, and at period of writing had not been captured.

According to an estimate by an officer of the company, approximately 2,100 passengers were sent out of the Jersey City station of the Pennsylvania in 15 minutes on July 16, practically all of them bound for long-distance points, without interrupting regular traffic. The occasion was the breaking up of the convention of the Prudential Life Insurance Agents. Each passenger had a number on his ticket indicating the exact car to which he was assigned, and at each entrance gate of the station and at the end of each train were large placards, indicating the destination of the train and the special destination which had been given to each car composing it. Each train had a similar marker, and each car was placarded with its destination.

The Appellate Division of the Supreme Court of New York decided July 13 that the New York City Ry. Co. need not give transfers at the intersection of its Broadway and Twenty-third street lines. Justice Hatch based his opinion on the broad rule that the public safety and convenience should be taken into account, and that it is proved that danger to traffic and person might result from a wholesale transfer system at such a crowded spot as Twenty-third street and Broadway. Justice Ingraham, in a concurring opinion, said that the law requiring that transfers be given for a continuous trip does not apply to leased roads where the the lease, as in this case, was executed prior to May 1, 1891, and such leased roads are expressly exempted from issuing transfers. In several other suits for penalties at other points the judgment awarding the penalty to the plaintiff is upheld, because the leases for the road involved were executed after 1891 and no danger to public safety was alleged.

A Lunch Counter in the Baggage Car.

On July 9 a baggage car fitted with a lunch counter running the entire length of the car and well supplied with quick lunch provisions, was placed in service out of Chicago on the Pere Marquette, running on the week's end excursion trains to nearby summer resorts. According to reports, the idea has been well received and the car is very popular.

Fires.

The Baltimore & Ohio grain elevator at 87th street and Ontario avenue, South Chicago, and a number of cars, was destroyed by fire July 15; loss, about $350,000.

The warehouse of the Chicago, St. Paul, Minneapolis & Omaha, at Duluth, Minn., and a number of freight cars was destroyed by fire July 15; loss, about $300,000.

The Grand Trunk blacksmith and steel spring shop, at Point St. Charles, Montreal, was destroyed by fire July 11, at a loss of $10,000.

College Men as Street Car Conductors.

Efforts are being made by the Brooklyn Rapid Transit system to secure students as conductors and motormen during the time of the college vacation. Mr. Winter, President of the company, reports that the college men are courteous and faithful, and that they possess intelligence. "Our trainers can break in a college man in about half the time it takes to instruct the general run of applicants. Moreover, they are attentive to their duties and show a decent amount of regard for the interests of the company. They are not 'hairsplitters,' and are not above assisting aged and infirm persons on and off the cars. They know how to give a civil answer to patrons of the road, and are, all around, admirable men." Next summer the company expects to have over 1,000 college men in its temporary employ.

Ventilation in the Gallitzin Tunnel.

According to press reports, a double set of fans, worked by steam, will be placed in the east mouth of the Gallitzin tunnel to serve as a means of removing the smoke and gases, which are especially troublesome in hot weather. It will be recollected that the Norfolk & Western had a problem somewhat similar in the ventilation of the Elkhorn tunnel, described in the *Railroad Gazette*, May 10, 1901. In this case ventilation was provided by building an air chamber in the side walls and roof of the tunnel, to serve as the nozzle of an injector, and two fans 14 in. in diameter, each operated by an engine of 75 h.-p., were installed to drive the smoke ahead of each eastbound engine, which had to ascend a grade of approximately 1.4 per cent. The results from this Elkhorn installation have been very satisfactory.

Charge for Storage in a Railroad Depot.

The Interstate Commerce Commission, in the cases of John W. Blackman, Jr., of New Orleans, against the Southern and the Columbia, Newberry & Laurens, held that a railroad freight depot and a public storage warehouse are not used for similar purposes, and the charge for storage in the railroad depot may properly be made higher than the public warehouse charge with the object of compelling the expeditious removal of freight. The Southern Railway in applying the complainant's interstate traffic at Macon, Ga., the storage rates prescribed by the Georgia Railroad Commission, and the C., N. & L. in applying to complainant's interstate traffic at Columbia, S. C., the storage rates prescribed by the South Carolina Railroad Commission, although such storage rates were in excess of the usual public warehouse charges in Macon and Columbia, did not violate the act to regulate commerce.

C. P. R. Irrigation in Alberta.

The Canadian Pacific has undertaken a tremendous irrigation scheme in the province of Alberta. The plan is to irrigate an area 150 miles by 60 miles, situated near Calgary. About three years has been spent in preliminary surveys for the proposed canal, and it is estimated that 1,500,000 acres in this region can be irrigated successfully, at an ultimate cost of between $4,000,000 and $5,000,000. Work has been commenced on a main canal 20 miles long, 60 ft. wide and 10 ft. deep. About 85 miles of distributing canals have also been located and when these are completed about 300,000 acres will be rendered available for cultivation, and about 400,000 acres of the surrounding land made available for grazing and dairying. The estimated cost of this section of the work is $1,300,000, and, if it proves to be a success, the necessary extensions will be made to finally irrigate the total area planned. The railroad company expects to sell grazing lands for $4.50 or $5 an acre and the arable lands at $10 an acre. In this way the company expects to get back the investment made in the scheme, and at the same time open up new territory adjacent to its lines.

Two Reports on the Western Traffic Outlook.

President Ripley of the Atchison and Vice-President Caldwell of the Lackawanna have each given out in an interview their opinion on the general situation in the West. Mr. Ripley says that the crop losses have been considerable, and that dry weather and sunshine are needed to revive the grain. He called attention to the fact that industries of all kinds, mining and manufacturing, have now increased in the central and southwestern part of the country to such a degree that the railroads are getting plenty of business from one source or another to take the place of any that may fail temporarily, and he said that if one-fourth of the wheat crop in Kansas was ruined, the State would not feel it a month after the harvest was completed. Mr. Caldwell considers that for the next month or two the movement of eastbound traffic will be considerably lighter than last year, that there will be very little grain to move in advance of the new crop, and that flour shipments will be compara-

tively light, as the mills in the Northwest are running on about half time. He concludes, however, that the prospects for the crops in the West are, on the whole, quite satisfactory, and that in case they turn out well there will be no occasion to fear any very serious falling off in business for the coming year.

The Manchester Ship Canal Improvement Scheme.

Early in May a Select Committee of the House of Lords sat in London to hear evidence for and against the scheme of the Manchester Ship Canal Company for deepening the canal throughout its entire length. The object is to provide a passage for steamers with a dead weight capacity of 11,500 tons and to divert the channel of the Mersey at Warrington with the construction of a dam with sluices in order to regulate and control the flow of water and diminish the deposit of sludge and silt in the upper estuary. The present depth of 26 ft. would be increased to 28 ft. from Eastham to Manchester, and the velocities both from the flood and ebb tide, which are now a danger to navigation, will be diminished. This will facilitate the passage of large steamers and decrease the cost of dredging. As things are at present many vessels have to load light in order to get up the canal. The engineer in chief of the Ship Canal Company (Mr. Hunter) detailed the proposed works, which are to cost about $450,000, and said that they could be carried out in two years. If, however, instead of raising the sills of the tidal portion of the canal the company was compelled to dredge in order to get the increased depth of 2 ft., six years would be the time occupied. Sir Benjamin Baker showed that the raising of the level of the water would not injuriously affect the estuary of the Mersey or any other interests concerned. Further to dredge the tidal portion of the canal was both bad engineering and bad commerce. The 2 ft. depth meant to Manchester the difference between a first and second class port. There was opposition offered to the scheme by Warrington traders, and it was contended that the Ship Canal Company was merely trying to evade its Mersey dredging obligations.

A New Ordnance Vessel.

The Chief of Ordnance, United States Army, has let contract to Pusey & Jones, of Wilmington, Del., for a steam vessel for the Ordnance Department of the army at their bid of $72,500. The vessel will carry freight and passengers between New York City and the army proving ground at Sandy Hook and will also be used in the river and harbor work around New York. The steamer will be 120 ft. long and 26 ft. beam and will have a speed of 13½ miles an hour.

Use of Coal Briquettes in France.

The inspector-general of the Paris, Lyons & Mediterranean Railroad Company, at Lyons, France, says that his road uses large quantities of coal briquettes (about 10 per cent. of its fuel). The road is enabled to utilize all the slack and coal dust from the mines. The engineers can get up steam more quickly with briquettes than with any kind of coal without them. They form no slag or clinkers and tend to prevent the formation of clinkers when used with other coal. The company manufactures its own briquettes. About 65 per cent. of its fuel consists of fine coal. or slack. A specimen of coaleo (a form of briquette made in St. Louis, Mo.) sent from St. Louis, has attracted a great deal of attention here, and the coal men naturally imagine that Americans will be exporting this fuel to France soon. —*Consular Report.*

Manufacturing and Business.

The Philadelphia & Reading has issued specifications for machine tools for its various shops, to cost about $100,000.

The Pennsylvania has issued classified specifications for a large amount of machine tools for its various shops, including many for the new shops at Olean, N. Y.

The Montpelier Foundry & Furnace Co., of Montpelier, Ohio, it is said, will put up a brick addition to its machine shop, and put in some machinery.

The Coughlin-Sanford Switch Co., 25 Broad street, New York City, has received orders to install the Coughlin-Sanford frog and switch on the Vandalia and Pere Marquette roads.

The Independent Railroad Supply Company, Chicago, has recently shipped five miles of Wolhaupter rail joints to the "Soo" Line, to be used on the new Winnipeg division.

The Vulcan Iron Works Company, Toledo, Ohio, is sending out a map of the Russian-Japanese war territory. It is 16 x 19½ in. and shows the countries to good scale and well in detail.

The Crocker-Wheeler Company, Ampere, N. J., announces that it is prepared to give free to clients expert advice on shop management. For this purpose it has retained the services of Dodge & Day, modernizing engineers, Philadelphia.

The Affleck Concrete Steel Tie Co., of Jersey City, has been incorporated in New Jersey with a capital of $100,000, to make cross ties. Thos. H. Haggerty, of Jersey City, N. J., is one of the incorporators.

The Pitt Manufacturing Company, Ellwood City, Pa., has recently secured orders for the entire equipment of metal packings for the new work of the National Tube Company at Lorain, Ohio, and McKeesport, Pa.

The contractors for the Pennsylvania tunnel under the North River have awarded a contract for 8,000 tons of bolts to the Cambria Steel Co. at about $40 a ton, which makes the order worth approximately $320,000.

Frederick A. C. Perrine, First Vice-President of the Stanley Electric Manufacturing Co., which is controlled by the General Electric Co., has resigned to devote his attention exclusively to private practice as consulting engineer.

Capitalists of Columbia, Tenn., are organizing a company to build a new grain elevator, warehouse and feed mill in West Nashville, Tenn. The new company will be capitalized at $70,000. J. Briggs McLemore and G. W. Howard, Jr., of Columbia, are interested.

The Lawrence Machine Co., of Boston has been incorporated in Massachusetts, with a capital of $250,000. The officers and directors are: President, Joseph Battles, North Andover, Mass.; Treasurer, William S. Kershaw, Lawrence, Mass.; Clerk, William O. Webber, Brookline, Mass.

The King Bridge Co., of Cleveland, Ohio, recently sent one of the largest shipments ever made by a single concern of bridge material. The order was sent by a special train of 36 cars to the Chicago, Burlington & Quincy for its bridge over the St. Croix River at Prescott, Ariz.

John R. Lee & Co., of Rochester, is the name of a concern incorporated in New York, with a capital of $300,000, to do a general contracting and engineering business. The directors are: J. P. Lee, Paterson, N. J.; J. D. Lazell, New York, and E. S. McNaul, Philadelphia.

Charles M. Schwab, it is reported, has formed a new company with a capital of $500,000, to make welding or seamless tubing. The company will locate its works near Pittsburg, or Elyria, Ohio. E. S. Miller, of the Elyria Iron & Steel Co., and formerly assistant to the President of the National Tube Co., is also interested.

Dodge & Day, modernizing engineers, Philadelphia, in conjunction with Ballinger & Perrot, Architects, are rebuilding and extending the plant of the Victor Talking Machine Company, Camden, N. J. The shops are to be electrically operated and motor drives used throughout. The work is to be completed within six months.

Dr. Schuyler Skaats Wheeler, President of Crocker-Wheeler Company, electrical manufacturers, sailed June 13 on the White Star liner Baltic and expects to make a coaching trip through England. Early this spring Dr. Wheeler went on an automobile tour through the South of France and returned with the American patent rights of the electrical firm of Brown, Boveri & Cie, of Baden, Switzerland.

The Mexican Car & Foundry Co., of Mexico City, of which Isaac M. Hutchison is President, is said to have given a contract to John Hooper, of that place, for the following buildings: Erecting shop, 350 ft. x 50 ft.; blacksmith shop, 200 ft. x 80 ft.; machine shop, 200 ft. x 80 ft.; woodworking shop, 255 ft. x 30 ft.; foundry, 200 ft. x 80 ft.; axle, wheel and truck shop, 65 ft. x 80 ft.; store, 80 ft. x 50 ft., and pattern shop, 100 ft. x 55 ft. The equipment to be added will cost about $75,000.

The Walter A. Zelnicker Supply Company, St. Louis, has an attractive exhibit in the Transportation Building at the World's Fair, showing, among other things, the Zelnicker portable wheel press in operation. Included in the other specialties exhibited is the double-clutch car mover which this company makes. A number of recent sales of the wheel press are reported, and the demand for the car movers has exceeded the capacity of the factory to produce them. The company advises that a sample of its lumber crayon will be sent on request.

Bids are wanted August 10 by the Board of Public Service of Columbus, Ohio, for three 11,000,000 gal. centrifugal pumps each direct connected to a vertical compound condensing engine, two 4,000,000 gal. do., two 10-k.w. direct-current generators connected to simple engine, one switchboard, one hand 6-ton traveling crane, three horizontal, 150-h.p. each, water-tube boilers, two surface condensers, two air pumps, two boiler and feed pumps, one fuel economizer, one feed-water heater and one oil filter. Charles H. Frank is Secretary.

Manning, Maxwell & Moore have secured a large order, amounting to between $150,000 and $160,000 worth of tools from the Illinois Central Railroad, to be shipped to the various shops along their lines. This is one of the best orders for machine tools that have been placed in a long time. The order consists of a full line of railroad tools, such as driving wheel lathes, axle lathes, car wheel borers, steam hammers, large and small engine lathes, punching and shearing machinery; also, woodworking tools, radial drills, shapers, bolt cutters, brass lathes,

grinding machinery, planers, slotting machines, vertical and horizontal boring machines, centering machines, a full line of tool room tools and milling machines. The company also secured the order for all the electric traveling cranes required by the Illinois Central. Other orders recently secured by Manning, Maxwell & Moore include tools for one of the government powder depots, consisting of engine lathes, shapers, radial drills, grinders, etc.; tools for the navy yards, consisting of large forging machines, engine lathes, punches and shears, radial drills and grinders; an order for a large number of radial drills, engine lathes, grinders and woodworking tools for one of the Central Railroad Company of New Jersey shops; an assortment of machine tools going to some of the Western railroads, consisting of a general line of railroad tools, such as engine lathes, radial drills, shapers, grinders and woodworking tools.

The Broderick & Bascom Rope Company, St. Louis, has a unique and attractive exhibit in the Manufacturers' Building at the World's Fair. The centerpiece is a cable spool, on which is wound a bronze-colored steel cable, a fac-simile of which was made for the Metropolitan Street Railway, of New York. The spool is mounted on a massive steel wagon, the whole requiring 56 horses to move it. On each end of the spool is an 8-ft. revolving disk, on which are mounted samples of the different kinds of rope made. The space is enclosed by a specially designed fence made of 3-in. steel tape. The exhibit contains a number of other attractive features.

Iron and Steel.

The Jones & Laughlin Steel Co., of Pittsburg, is planning to build a large tube mill at Wilson Station, on the Monongahela river, about six miles west of McKeesport.

The Shenango Furnace Co., of Pittsburg, which is allied with the Oliver interests, it is said, will build two new blast furnaces at Sharpsville, on which work will soon be started. The company has given a contract to the Sharon Boiler Co. for four new hot blast stoves to be built at once, to cost about $75,000.

Nearly every mill in the Homestead Steel Works of the Carnegie Steel Co. was started on double turn July 19, giving employment to about 10,000 workmen. The Bessemer converting mill and the 28-in. mill, which have been shut down for more than six months, and the 10, 23 and 33-in. mills, which have been running single turn, and also the open hearth plant are in full blast and on double turn. The 119-in. mill, which is being remodeled into a 72-in. mill, will start on double turn about next week.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 30.)

Pacific Northwest Society of Engineers.

The second annual convention of this society was held in Seattle, Wash., July 1 and 2, the attendance being about 110. The general business meeting was held on the morning of the 1st, at which time the President delivered his address. At the afternoon session two addresses were delivered, one being "The Cedar River Municipal Light Plant," by R. H. Thompson, and the other on "An American Engineer in Europe," by Geo. F. Cotterill. The rest of the time was spent in making inspection trips and in other forms of entertainment.

PERSONAL.

—Mr. George B. Pearson, a pioneer railroad builder, died at his home in Fort Dodge, Iowa, on July 14, at the age of 75. Mr. Pearson built the Fort Dodge & Fort Ridgely Railroad, which is now a part of the Minneapolis & St. Louis.

—Admiral J. G. Walker, Chairman of the Isthmian Canal Commission; Professor William H. Burr and C. E. Grunsky, also of the Commission, have been elected Directors of the Panama Railroad Company, succeeding Messrs. Charles F. Einseidler, J. G. Buchanan and Charles Paine, resigned.

—Mr. Joshua Vansant McNeal, the new Fourth Vice-President of the Baltimore & Ohio, was born in Baltimore and was educated in the public schools of that city and at Loyola College. He is the son of the late James McNeal, of Baltimore. After eight years of business life in the insurance busi-

ness, during which time Mr. McNeal was Secretary of the Resolute and Atlantic Fire and Marine Insurance Companies, he entered the service of the Baltimore & Ohio, taking a position in the accounting department and was Chief Clerk of the department for about eight years. In 1880 he went to Indianapolis, where for thirteen years he remained on the Indianapolis, Decatur & Springfield. In 1893 he resigned to enter the service of the Baltimore & Ohio, where he served as Assistant Treasurer until the retirement of Mr. Ijams, when he was elected Treasurer, from which position he is now chosen to become the Fourth Vice-President, in charge of the financial affairs of the company.

—Mr. A. R. Holliday, whose appointment as Engineer of Maintenance of Way of the Pennsylvania Company, was recently announced, was born in Indianapolis in 1877. He graduated from the public schools in that city, and, in 1899, received his degree from the Massachusetts Institute of Technology. In August of that year (1899) he went to work for the Pennsylvania Company at Allegheny. In January, 1901, he was made Assistant Engineer, but was shortly transferred to the Erie and Ashtabula Division, where he remained until January of this year, when he became Assistant Engineer on the Chicago Terminal Division. This latter position he held until his new appointment at Indianapolis.

—Mr. John C. Moorhead, at one time General Manager of the Ohio Division of the Erie Railroad, died suddenly at his home in Cleveland, Ohio, on Tuesday of this week. Mr. Moorhead was born at Moorheadville, Pa., in 1844, and began his railroad work in 1862 as a telegraph operator on the Lake Shore & Michigan Southern. For eight years from 1880 he was Assistant Division Superintendent on the Michigan Central and for a few months in 1888 was Division Superintendent at Galion, Ohio, for the New York, Pennsylvania & Ohio. Later he went to Cleveland as Superintendent of Transportation, and from 1891 to 1900 was General Superintendent. In the latter year he was appointed General Manager of the Ohio Division of the Erie. Mr. Moorhead retired from active service about three years ago owing to ill health.

—Mr. John H. Wynne, the new Mechanical Engineer of the Illinois Central, was born in 1876. He is a graduate of the mechanical engineering course of Cornell University, class of '98, and spent one year additional in post-graduate work in the railroad engineering course. After leaving college he went to the Chicago Great Western as a Special Apprentice. Three months later he resigned and went to the Illinois Central, where he completed the course at the Burnside shops. He then worked as a machinist for two months, when he was transferred to the Waterloo (Iowa) shops as a machinist and Assistant Foreman. The following April (1902) he took a position with the Procter & Gamble Company, Ivorydale, Ohio, as Mechanical Engineer, but after a few months returned to the service of the Illinois Central as gang foreman at Burnside. In 1903, he was made general foreman of the Richmond Division of the Southwest System of the Pennsylvania Lines West of Pittsburg, which position he resigned to accept his present position with the Illinois Central.

—Mr. Robert W. Baxter, who in the early part of July became Superintendent of the Pennsylvania & New York Division of the Lehigh Valley, is a native of Scotland, and is 45 years old. He entered railroad service in 1870 as a telegraph operator on the Union Pacific, and served continuously for about twenty years as Train Despatcher, Chief Train Despatcher, Trainmaster, Assistant Superintendent and Superintendent. For about five months in 1891 he was Superintendent of the Ohio & Midland Division of the Baltimore & Ohio, but in September, 1891, he returned to the company where he received his early training (Union Pacific) as Superintendent of the Oregon & Washington Division, with office at Portland. The next year (1892) he was appointed Acting General Superintendent of the Pacific Division, receiving the title of General Superintendent of the same division two years later. From 1894 to 1898 he was General Agent of the Pacific Division for the Receivers, and in the latter year was appointed Superintendent of the Nebraska Division of the Union Pacific. Mr. Baxter's office as Division Superintendent of the Lehigh Valley will be at Sayre, Pa.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—W. B. Storey, Jr., hitherto Chief Engineer of the San Francisco & Northwestern, has been appointed Chief Engineer of the A., T. & S. F., with headquarters at Topeka, Kan.

Baltimore & Ohio.—J. V. McNeal, Treasurer, has been elected Fourth Vice-President.

Burlington Route.—See Colorado Midland.

Central of Georgia.—The offices of First and Second Vice-President have been created, and A. R. Lawton and W. A. Winburn (Vice-President and Traffic Manager) have been elected First and Second Vice-Presidents, respectively. Mr. Lawton will as-

sist the President generally in executive business, and have special supervision of contracts, property rights, insurance, taxes and legal affairs. Mr. Winburn will have charge of traffic, with office at Savannah.

C. T. Airey has been appointed Assistant General Freight Agent, with headquarters at Savannah.

Chicago, Burlington & Quincy.—L. F. Goodale, hitherto Chief Engineer of the Missouri Lines, has been appointed Engineer of Maintenance of Way. The office formerly held by Mr. Goodale has been abolished, and the jurisdiction of W. L. Breckenridge, Chief Engineer of the C., B. & Q., has been extended over all the lines east of the Missouri River.

Chicago, Peoria & St. Louis of Illinois.—J. P. Ramsey has been appointed General Manager, with headquarters at St. Louis, succeeding W. H. Gridley, resigned.

Chicago, Rock Island & Gulf.—P. A. Auer has been appointed General Passenger Agent, with headquarters at Ft. Worth, Texas, succeeding the late W. H. Firth.

Chicago, Rock Island & Pacific.—Guy Adams, hitherto Division Passenger Agent of the Delaware, Lackawanna & Western, has been appointed Superintendent of Mails of the C., R. I. & P., with headquarters at Chicago, succeeding J. O. Crockett, Superintendent of Telegraph and Mails, who has been promoted (page 33), effective August 1.

W. M. Whittenton, hitherto Superintendent of the Pan-Handle Division, has been appointed Superintendent of the Arkansas Division, succeeding F. B. Stewart, and Mr. Whittenton has been succeeded by G. A. Merrill, hitherto Superintendent of the Dakota Division.

G. B. Albright has been appointed Assistant General Freight Agent, with office at St. Louis.

Colorado Midland.—George W. Vallery, hitherto General Agent at Denver for the Burlington Route, has been appointed General Manager of the C. M., succeeding C. H. Schlacks, effective August 1.

Delaware, Lackawanna & Western.—See Chicago, Rock Island & Pacific.

Louisville & Atlantic.—J. R. Pates, hitherto Trainmaster, has been appointed Superintendent.

Louisville & Nashville.—Matters heretofore reported to the First Vice-President will hereafter be reported to the President. W. L. Mapother has been appointed Assistant to the President.

Mexican Central.—W. K. Macdougald has been appointed Assistant General Passenger Agent, with headquarters in the City of Mexico, effective August 1.

Missouri, Kansas & Texas.—Joseph Price has been elected a Director, succeeding J. D. Rockefeller, resigned.

Nevada Central.—Ellsworth Daggett has been appointed General Manager, succeeding S. T. Pearson, resigned. J. M. Hiskey has been appointed Superintendent, with headquarters at Austin, Nev. He will continue in charge of the accounting department as Secretary and Auditor.

New York & Pennsylvania.—G. R. Brown, Receiver and General Manager, has resigned.

New York, Chicago & St. Louis.—F. J. Moore has been appointed General Baggage Agent and Superintendent of Dining Service, succeeding C. C. Denton, resigned.

Oregon Railroad & Navigation Co.—J. F. Graham, hitherto Master Mechanic, has been appointed Superintendent of Motive Power. He will have charge of the general shops and supervisory authority over division shops.

Rio Grande, Sierra Madre & Pacific.—E. W. Mead, hitherto Auditor, has been appointed General Manager, succeeding J. P. Ramsey, resigned. (See Chicago, Peoria & St. Louis of Illinois.)

St. Joseph Terminal.—H. U. Mudge (General Manager, Santa Fe) has been elected Vice-President, and Edward Wilder, Treasurer of the Santa Fe, has been elected Treasurer of the St. Joseph Terminal.

San Francisco & Northwestern.—See Atchison, Topeka & Santa Fe.

Seaboard Air Line.—D. H. Ground has been appointed Superintendent of the Sixth Division, with headquarters at Jacksonville, Fla., succeeding A. P. Connelly.

LOCOMOTIVE BUILDING.

The San Pedro, Los Angeles & Salt Lake is contemplating purchasing a number of locomotives.

The Lake Shore & Michigan Southern is having 10 locomotives built at the Baldwin Locomotive Works.

The Duffy Construction Company, Chicago, has ordered four locomotives from the Davenport Locomotive Works. This is in addition to the order for 18 locomotives reported in our issue of July 15.

The Cincinnati, Hamilton & Dayton-Pere Marquette System is reported to have ordered 40 locomotives from the American Locomotive Co. We have been unable to verify this order, but indications point to its having been placed with the above company.

The Millen & Southwestern has received one 10-wheel (4-6-0) locomotive from the Baldwin Locomotive Works. The engine weighs 114,000 lbs., with 90,500 lbs. on drivers; cylinders, 17 in. x 24 in.; diameter of drivers, 54 in.; wagon top boiler, 180 lbs. steam pressure; 229 tubes; 12 ft. 6 in. long and 2 in. in diameter; fire-box, 8 ft. long, 2 ft. 9¼ in. wide. The tender has a capacity of 3,500 gallons of water and three cords of wood. The special equipment includes Westinghouse brakes, Tower couplers, Sellers injectors, Dressel headlight, Damascus bronze bearings, U. S. Metallic packing, Standard steel driving wheel centers.

CAR BUILDING.

The American Car & Foundry Co. has miscellaneous orders for 12 cars.

The Erie is reported to have ordered 500 box cars from the Standard Steel Car Co.

The German-American Line is having 100 freight cars built by the Standard Steel Car Co.

The Intercolonial of Canada is having six standard sleeping cars built by the Pullman Co.

The Wabash has ordered 15 passenger coaches from the American Car & Foundry Co.

The San Pedro, Los Angeles & Salt Lake has ordered 15 oil tank cars from the Pressed Steel Car Co.

The Long Island will, it is reported, soon place an order for 100 electric cars for regular service.

The Buffalo, Rochester & Pittsburg is having 37 freight cars built at the Buffalo works of the American Car & Foundry Co.

The Columbia Electric Street Railway, Light & Power Co. has ordered six closed motor bodies from the American Car & Foundry Co.

The Norfolk & Western has ordered 600 box cars of 80,000 lbs. capacity from the American Car & Foundry Co., and will build 200 hopper cars of 100,000 lbs. capacity at its Roanoke shops.

The Cincinnati, Hamilton & Dayton-Pere Marquette System, as reported in our issue of July 15, has ordered 5,000 freight cars from the American Car & Foundry Co.

The Wabash is reported to be in the market for 1,000 coal cars. These cars are for use on the Wheeling & Lake Erie and West Virginia Central & Pittsburg railroads.

The Harriman Lines, as reported in our issue of June 10, have ordered 1,000 flat cars of 100,000 lbs. capacity and 250 oil cars of 100,000 lbs. capacity from the Pressed Steel Car Co. and 1,000 box cars of 100,000 lbs. capacity from the American Car & Foundry Co. All these cars are for July and August, 1904, delivery. The flat cars will weigh 34,000 lbs. and will be 40 ft. 10 in. long and 9 ft. 4½ in. wide over floor with metal underframes. The oil cars will weigh 42,000 lbs. and will be 41 ft. 10 in. long over end sills and 8 ft. 5¼ in. wide over side sills, with metal underframes. The box cars will weigh 43,000 lbs. and will be 40 ft. long, 8 ft. 6 in. wide and 8 ft. high, all inside measurement. The special equipment for all includes: Simplex bolsters, Damascus brake-beams, American Brake Shoe & Foundry Co.'s brake-shoes, Climax couplers, Miner draft rigging, National Malleable Castings Co.'s journal boxes and journal-box lids, arch bar trucks and Railway Steel-Spring Co.'s springs.

BRIDGE BUILDING.

Allegan, Mich.—Residents voted to raise $9,000 for building a steel bridge over the Kalamazoo River.

Attleboro, Mass.—Legal obstructions to the plans for abolishing the grade crossings have been removed and the town is ready to proceed with the work. The estimated cost is $800,000.

Bloomfield, Ind.—The Indiana Bridge Co., of Muncie, has been awarded a contract for building a new bridge over White River, to cost $22,000.

Bids are wanted August 2 by the Board of Commissioners of Greene County for building seven small bridges. William H. Deckard is Auditor.

Burlington, Kan.—Bids are wanted August 11 by the County Commissioners for building a steel bridge, 216 ft. long, over the Neosho River, in Coffey County. J. W. Sims is Commissioner.

Calgary, N. W. T.—A by-law was approved by the ratepayers to build a steel bridge over the Elbow River.

Chattanooga, Tenn.—The McCallie avenue viaduct, it is reported, will be built at once. The cost of the work will be divided as follows: The county will pay $17,000; the Chattanooga Electric Railway the same amount; the Cincinnati, New Orleans & Texas Pacific Railway the same amount, and the Nashville, Chattanooga & St. Louis Railway, which has one track running over McCallie avenue, will pay about $7,000. Immediate action will be taken looking to the letting of the contract.

Columbus, Ohio.—Separate bids are wanted July 26 by the Board of Public Service for building the masonry substructure and for the steel superstructure of a single-track railroad bridge over the Scioto River in Franklin County. Charles H. Frank is Secretary.

Dayton, Ohio.—The ordinance authorizing a bond issue of $10,000 for building the Summit street bridge over Wolf Creek has been passed and the Board of Public Service authorized to ask for bids.

Galt, Ont.—The ratepayers of North Dumfries have approved a by-law to raise $10,000 to build a steel bridge over the Grand River.

The Canadian Pacific Railway Company will probably widen the subway at Bond street.

Guthrie, Okla. T.—The continued rains have flooded Salt Fork Creek, in Western Oklahoma beyond any previous record. Both the Kansas City, Mexico and Orient and the Rock Island bridges were destroyed and many highway bridges along the Salt Fork have been carried away.

Harrisburg, Pa.—Bids are wanted August 2 by J. M. Shumaker, Superintendent of Public Grounds and Buildings, for rebuilding the substructure and the superstructure of the bridge over Connoquenessing Creek, in Butler County.

HATBORO, PA.—The County Commissioners decided to build a three-arch stone bridge over a branch of Pennypack Creek, on Moreland avenue.

LIMA, OHIO.—Bids are wanted July 27 by Geo. Feltz, Auditor of Allen County, for building a steel bridge, 140 ft. long and 14 ft. wide, over the Auglaize River in Amanda Township, to replace the present structure.

MARION, IND.—Bids are wanted August 6 by H. Goldthwaite, Auditor, for building a steel bridge with two spans, each 160 ft. long, to cost about $25,000, in Grant County.

MEMPHIS, TENN.—The City Council and the railroads interested are again considering the question of jointly building the bridge over the tracks at Elmwood Cemetery. J. A. Omberg, Jr., is City Engineer.

PORTLAND, ORE.—The City Council has passed a resolution to build a steel bridge over Sullivan's Gulch, at Union avenue, and will appropriate an additional $45,000 for building the bridge at Grand avenue.

READING, PA.—The County Commissioners will replace the oldest bridge in Berks County, the old two-stone arch at Douglassville, in Amity Township, built in 1797, with a new iron bridge.

SAN JOSE, CAL.—Bids are wanted July 25 by the Board of Supervisors of Santa Clara County for building a bridge over the Guadalupe Creek on the Alviso and Santa Clara roads. Henry A. Pfister is Clerk.

SEYMOUR, IND.—Bids are wanted August 4 by the Board of County Commissioners for building 14 small bridges in Jackson County. Asbury H. Manuel is County Auditor.

SHELLMOUTH, MAN.—Three new bridges will be built over the Assiniboine River. Shell River Council will probably build a new steel bridge at this place.

SIOUX CITY, IOWA.—A petition signed by 2,000 residents has been presented to the Council asking that a viaduct be built over the tracks at Steuben street.

TOLEDO, OHIO.—The Toledo Urban & Interurban Railway Co. has given a contract for the bridge to be reconstructed just above the present wagon bridge at Maumee to Kupper & Hall, of Canton, Ohio, who will begin work about August 1. The American Bridge Company has the contract for the material. Henry Spieker has been given the contract for masonry. The bridge, when complete, will cost $100,000. Several additional contracts for bridges and other work will be let soon.

VERSAILLES, IND.—Bids are wanted August 2, by Nicholas Volz, County Auditor for building the abutments of a highway bridge over Pipe Creek in Ripley County.

WILLIAMSPORT, IND.—The County Auditor will ask bids August 1 for $90,000 of bonds for building two new bridges over the Wabash River.

Other Structures.

CINCINNATI, OHIO.—A new union passenger station is to be built by a company organized for that purpose and is to be completed in three years.

FRANKLIN, TENN.—The Louisville & Nashville, it is reported, will build a station, to cost $20,000.

GREENVILLE, S. C.—The Southern, it is reported, is receiving bids for its new passenger station here, to cost about $35,000.

HERKIMER, N. Y.—The New York Central, it is reported, has plans ready for building a passenger station, freight house and subway, on which work is to be soon commenced.

LONDON, ONT.—The Grand Trunk, it is said, will at once build a new roundhouse to hold 45 locomotives, also new freight sheds and a station in the immediate future, to cost about $75,000 and will cover two acres of ground; a large turntable will also be added.

MERIDIAN, MISS.—The New Orleans & Northeastern and other lines of the Queen & Crescent system, and officials of the Mobile & Ohio and Southern Railways are considering details pertaining to the erection of the new passenger and freight stations here. A union station to cost at least $150,000 will be erected. President Harvey of the N. O. & N. E. has been authorized to act for all roads interested.

NEW YORK, N. Y.—The New York Central has filed plans with the Building Department for its large power house to be built at 149th street, near Long Island Sound. They call for a granite and brick building, 236 ft. long and 176 ft. wide, to cost $500,000. The contract for the concrete foundations has been awarded to E. C. Weeks & Son and work is now in progress. Bids for the superstructure will be asked as soon as this work is completed.

PINE BLUFF, ARK.—The St. Louis, Iron Mountain & Southern, it is reported, will soon build a passenger station here.

PORT HOPE, ONT.—The Grand Trunk, it is reported, will build a new station and a large coaling depot here.

SEATTLE, WASH.—The Northern Pacific, it is reported, will build a $250,000 building on the land it owns bounded by Madison and Spring streets and Railroad and Western avenues.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ADAIR COUNTY.—Chartered in Missouri to build from Youngstown on the Iowa & St. Louis to a point in Adair County. J. G. Trimble, E. M. Collins and others of Kansas City are incorporators.

BATTLE CREEK & GRAND RAPIDS INLAND LAKES TRACTION.—This company has filed articles of incorporation in Michigan, with a capital stock of $520,000, for the purpose of building from Battle Creek through Gull Lake, Hickory Corners, Prairieville, Orangeville, Gunn Lake, Yankee Springs, Green Lake and Crosby to Grand Rapids, 65 miles. A. A. Aldrich, Hickory Corners; A. J. White, Battle Creek, and J. N. Pike, Orangeville, are directors.

BAY MINETTE & FORT MORGAN.—An officer writes that contracts for grading will be let as soon as the surveys are completed. The proposed route is from Bay Minette, Ala., in a southerly direction to Fort Morgan, 45 miles. W. W. Olney, Bay Minette, Ala., is Chief Engineer. (July 1, p. 23.)

ERIE & MICHIGAN RAILWAY & NAVIGATION CO.—This company has been incorporated in Michigan, with a capital stock of $250,000, for the purpose of building a line of railroad about 30 miles long from the docks in Alabaster, Iosco County, to connections with the Michigan Central and the Detroit & Mackinac. The directors include: T. F. Robinson and A. C. Hebel, Alabaster, Mich.; C. F. P. Pullen, Milwaukee, and others.

GAINESVILLE, JEFFERSON & SOUTHERN.—It is reported that this road, which was recently sold at auction, will be extended from Gainesville, Ga., to Dahlonega. C. J. Baldwin, Savannah, Ga., may be addressed.

IONIA & OWOSSO.—Articles of incorporation have been filed with the Secretary of the State of Michigan. The purpose of the company is to build a railroad from Ionia to Owosso, 45 miles. The directors are: Governor A. T. Bliss, Saginaw; W. W. Steele and E. M. Hopkins, Detroit; F. S. Porter, Lansing, and others.

JENNINGS & NORTHERN.—According to press reports, this company is receiving bids for grading an extension from Jennings, La., to Keadle, 33 miles. C. C. Carey, Jennings, La., is Secretary.. (See Construction Supplement.)

KANSAS CITY, MEXICO & ORIENT.—Press reports state that the Mexican Government has just paid $400,000 in subsidies to this company for building a line according to plans made by the Mexican officials. This proposed line will run from a point on the main line of the K. C., M. & O. near San Angelo, Texas, to Brownsville, near the mouth of the Rio Grande, 300 miles.

KANSAS CITY, TULSA & SOUTHWESTERN.—Incorporation has been granted this company in Oklahoma with an authorized capital stock of $2,000,000. The proposed route is from a point on the St. Louis, Iron Mountain & Southern in the Cherokee nation, Indian Territory, through the Cherokee, Creek, Seminole and Choctaw nations in Indian Territory, Potowatomie, Cleveland, Lincoln, Oklahoma and Comanche counties in Oklahoma Territory, and Clay and Wichita counties in Texas to Wichita Falls, a total distance of 250 miles. The names of the incorporators are not stated.

LACKAWANNA & WYOMING VALLEY.—Work has been begun on a tunnel 4,700 ft. long from Crown avenue, Scranton, Pa., to South Scranton. Reinhardt & Dennis, Fairmount, W. Va., are the contractors. The tunnel will shorten the present distance between its lower opening and the station by at least one-half. The contractors propose to begin work at both ends and it is expected that it will take at least 18 months to complete the work. (April 29, p. 336.)

LITTLE ROCK & SOUTHERN.—This company has filed an amendment to its charter changing the location of its proposed route. The line is now projected to run from Hot Springs, Ark., in a southeasterly direction through Saline County to Traskwood and thence through Grant, Dallas, Calhoun and Bradley counties to the southern boundary line of the State of Arkansas. A branch line is also projected to a point near Eldorado. This road is a project of the Rock Island.

MOUNT STERLING SHORT LINE.—An officer writes that work will soon be begun on this proposed railroad from Mount Sterling, Ky., through Montgomery County to Indian Fields, in Oklahoma County, where connection will be made with the Lexington & Eastern. The work is fairly light and will include only one small bridge. E. S. Jouett, Winchester, Ky., may be addressed. (June 10, p. 450.)

NEW ORLEANS, HOUMA & NORTHWESTERN.—According to press reports, work is about to be begun on this proposed road from New Orleans via Houma, Morgan City and Gibson to Lone Star, Texas. A contract is reported let to James Cirigliano, Gibson, La. This company was incorporated over three years ago, but no work was ever done except that location surveys were completed shortly after incorporation. J. A. Humphreys, Lexington, Ky., is President.

NORTHERN & SOUTHERN ILLINOIS.—A charter has been granted this company in Illinois to build from Central, Marion County, through the counties of Marion, Jefferson, Franklin, Perry and Williamson to Herrin, Williamson County. At Centralia the new road will connect with the Illinois Central and the Baltimore & Ohio. The principal office will be in Chicago. Dwight Lawrence, T. P. Sheldon and C. A. Folsom, all of Chicago, are incorporators.

RAHWAY VALLEY.—This company has been incorporated in New Jersey, with an authorized capital stock of $250,000. The company will build from New Orange to Summit, six miles, connecting at the latter point with the Delaware, Lackawanna & Western. The incorporators are: Louis Keller, Springfield, N. J.; H. F. Dankel, Roselle, N. J., and others.

ST. JOSEPH, STANBERRY & NORTHERN.—A charter has been granted this company in Missouri to build a railroad from St. Joseph to Stanberry, 39 miles. George C. Sims, Des Moines, Iowa, J. E. Patrick and John J. Lea, St. Joseph, are incorporators.

SOUTHERN PACIFIC.—According to press reports, the cut-off between Ogden and Lucin will be open for traffic on August 15. This

is the portion of the line which was built across Great Salt Lake. (See Construction Supplement.)

RAILROAD CORPORATION NEWS.

Brooklyn Rapid Transit.—The work of abolishing grade crossings in Brooklyn will soon be begun, and bids for the work have already been asked. The grade crossing commission met on Tuesday to consider the Brighton Beach railroad changes of grade. The B. R. T., which controls the road, agreed to pay for all the expenses of changing the stations. The city will share in the cost of making the other necessary changes.

Chicago & Alton.—It has been announced that the stockholders of this company will hold a meeting in August to authorize an issue of $5,350,000, 3 per cent. bonds, which will be a part of the $40,000,000 authorized in 1899. To issue the bonds, however, it was agreed under the terms of the mortgage that a two-thirds vote of the stockholders must first be secured. It is stated that $350,000 of the new issue will be used to purchase the Quincy, Carrollton & St. Louis, and the balance will be held in the treasury for future improvements and expenditures.

Chicago, Rock Island & Pacific.—This company has renewed for five years its lease of the C. B. & Q. tracks from Cameron, Mo., to Kansas City. The lease includes the use of the Hannibal Bridge and the entrance tracks into the Union Station. The Rock Island has a contract with the Milwaukee and the Kansas City Belt Line Railway for the use of its terminals into Kansas City.

Detroit Southern.—The $30,000 receiver's certificates which have been authorized by the court on the application of Receiver Samuel Hunt are a part of a total issue of $1,000,000. Only $300,000 will be authorized at present. They will be of $5,000 each and will bear interest at 6 per cent., payable July 1, 1906, upon the termination of the receivership. The certificates are a first and prior lien on all of the property of the company. The proceeds of the $300,000 certificates will be used to pay all claims against the company covering a period of six months and to supply the company with funds to meet current needs.

Interborough Rapid Transit.—According to a recent State law made by Chief Contractor John B. McDonald, the New York Subway will be finished and in the hands of the operating company by August 1, 1904. The contract for the subway, which was let on Feb. 21, 1900, calls for its completion on August 21, 1904.

Lehigh Valley.—Philadelphia trust companies have notified the officials of this company that they intend to test in the courts the rights of preferred stockholders to cumulative dividends. In case this contention should be sustained the Lehigh Valley preferred stock would be entitled to 90 per cent., as no dividend has been paid in Lehigh common or preferred since 1893 until three weeks ago. The requisite 10 per cent. was than declared upon the preferred and 1 per cent. on the common; as the Lehigh has only $106,300 of preferred stock outstanding, and a surplus of nearly $5,000,000, it can, if necessary, pay back dividends on this stock without inconvenience. The case will be in the nature of a friendly proceeding, as the company has already granted the request for a list of preferred stockholders.

New York Central & Hudson River.—The following statement has been made by this company with regard to its plans for the electrification of part of its West Shore road: "The Cleveland, Ohio, interests, controlling Utica, Rome and Oneida street railroads, have acquired a controlling interest in the Syracuse Rapid Transit Company, and propose to merge these properties in one system. The Central has purchased an interest in these properties, and will probably enter into a trackage agreement for the use of the West Shore Railroad to connect the systems of which Syracuse and Utica are the centers. Further extensions, east and west, are in contemplation. The New York Central intends to aid the new company in taking care of and developing the short haul traffic to the fullest extent."

New York City Street Ry.—Redmond & Co., New York, are offering $250,000 Metropolitan Street Railway Co.'s refunding mortgage 4 per cent. gold bonds. The bonds are secured by a direct first mortgage on real estate in New York City. A general mortgage subject to prior lines of the Metropolitan Street Railway Company also secures these bonds. No more bonds can be issued under this mortgage, except for the purpose of refunding existing issues, until 1920.

Northern Securities Company.—Judge Bradford filed an opinion in the United States Circuit Court, at Trenton, July 15, granting a preliminary injunction restraining the proposed plan for the distribution of the assets of the Northern Securities Company in the proceedings instituted by Edward H. Harriman, Winslow H. Pierce and the Oregon Short Line. (For further comment see the editorial column.)

Quebec Southern.—Sealed tenders for the purchase of the Quebec Southern, comprising the railroads known as the South Shore, United Counties and the East Richelieu Valley, or any one of these railroads, will be received by the Registrar of the Exchequer Court of Canada, at Ottawa, Ont., up to 12 o'clock noon, on the 3d day of August, 1904. The three roads control 139 miles of track. (July 8, p. 30.)

Southern Pacific.—At a meeting of the stockholders of this company on July 20 it was voted to authorize an issue of $100,000,000 new preferred stock. Of this amount $40,000,000 will be issued at once. The proceeds will be used for betterments and refunding purposes. (July 15, p. 36.)

Tennessee Central.—The *Commercial and Financial Chronicle* says: The holders of all the outstanding 5 per cents. of 1902 (about $8,000,000) having agreed to the issue of new prior lien 5 per cent. bonds at $12,500 per mile (total issue not to exceed $4,200,000) for improvements and payment of floating debt and the exchange of the old bonds for an equal amount of new general mortgage bonds, all of the old bonds, viz., the Tennessee Central Railway, Nashville & Knoxville first mortgage bonds and Tennessee Central Railroad 5 per cents. of 1902 have been canceled, leaving the new prior lien bonds a first lien on the road. The new bonds are described as follows: Prior lien bonds authorized, $4,200,000, due January 1, 1934, subject to call on January 1, 1909, or thereafter at 110; outstanding, $4,014,000. General mortgage bonds authorized, $40,000,000, issuable at $37,500 per mile on present mileage (320 miles), including $4,200,000 reserved to retire the prior lien bonds and $25,000 per mile on new mileage constructed or acquired. Due January 1, 1954. Issued, $12,014,000, of which $4,014,000 are reserved to retire the prior liens as above stated.

Trinity & Brazos Valley.—A mortgage has been filed by this company with the Old Colony Trust Co., of Boston, as trustee, to secure an issue of 5 per cent., 30-year gold bonds of $1,000 each. These bonds are limited to $20,000 per mile, and are subject to call at any time in any amounts at 110. Some 80 miles of the line has been in operation for some months, extending from Cleburne to Mexia, Texas, and an extension is proposed southeasterly from Mexia to the coast. J. H. B. House is President, and R. H. Baker Vice-President, both of Austin, Texas.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY BY
THE RAILROAD GAZETTE
At 83 Fulton St., New York.

EDITORIAL ANNOUNCEMENTS:

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at 28 Victoria street, London, S. W. It consists of most of the reading pages and all of the advertisement pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name, Transport and Railroad Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

FRIDAY, JULY 22, 1904.

CONTENTS